Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

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LUDLOW GRISCOM

Vol. 37. July, 1935. No. 439.

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The New England Botanical Club, Inc.
8 and 10 West King St., Lancaster, Pa.
Room 1001, 53 State St., Boston, Mass.

RHODORA.—A monthly journal of botany, devoted primarily to the flora of New England. Price, $2.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) 20 cents. Volumes 1–8 or some single numbers from them can be supplied only at advanced prices which will be furnished on application. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Forms will be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 25 copies of the issue in which their contributions appear. Extracted reprints, if ordered in advance, will be furnished at cost.

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Ludlow Griscom, 8 W. King St., Lancaster, Pa., or Museum of Comparative Zoology, Cambridge, Mass.

Entered at Lancaster, Pa., Post Office as Second Class Mail Matter.

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A NEW SPECIES OF ANTENNARIA FROM THE APPALACHIAN REGION

G. Ledyard Stebbins, Jr.

In 1931, while studying the cytology of Antennaria, I noticed some specimens from Virginia identified as *A. neodioica* which looked smaller than the usual forms, and which appeared to be blooming earlier than typical *A. neodioica* in the same region. Some of these, moreover, had abundant staminate plants, which are notably rare, though occasionally found, in *A. neodioica*. Through the kindness of Mr. F. W. Hunnewell, one of whose collections was of this small form, I had an opportunity of examining the specimens in his personal collection, and found several sheets of it, some of which contained only staminate plants. One collection, from a large shale slope on Three Top Mt., Strasburg, Va., was very characteristic, and Mr. Hunnewell told me of its great abundance in that locality. Accordingly, I visited the spot in the spring of 1932, and although I was too early to obtain mature plants, I could recognize from the young buds that the staminate plants were as abundant as the pistillate, if not more so. I gathered enough young plants so that I could bring them to flower in pots, and found that they corresponded exactly with Mr. Hunnewell's specimens. The same spring I examined specimens in the herbarium of Dr. S. F. Blake, collected by Dr. H. A. Allard on a different part of the same hill. These were all staminate, and of the same size as the Hunnewell specimens, but differed considerably in the shape of the basal leaves and of the involucral bracts.

In the following year, 1933, Dr. Earl L. Core, of the University of West Virginia, very kindly met me at Hanging Rock, W. Va., and

teristics, the erose margins of the involucral bracts, and the sparsely pubescent achenes. It flowers about two weeks earlier than *A. neodioica*, and at the same time as *A. plantaginifolia*.

The typical form is apparently fairly common in dry woods in the Appalachian region of Virginia and West Virginia, wherever the underlying rock is shale, and occurs less commonly outside of the shale areas. The specimens from Vermont and New York are unexpected extensions of its range northward. The former is in every way characteristic of the pistillate plant, even possessing the scarious appendages on the cauline leaves. Although the staminate plant was apparently not collected, in view of its abundance southward, it should be looked for in the vicinity of Middlebury. A collection from New York, dry woods, altitude 2500 ft., Platte Clove, Catskill Mountains, C. S. Williamson, July 10, 1903 (Phila.) may be of this species. The basal leaves, inflorescences, involucres, corollas, and achenes are characteristic, but the cauline leaves are somewhat broader than in the southern material, and the upper ones, along with the upper part of the stems, are covered with red glandular hairs. In this case, also, the staminate plant was not collected.

The extreme of *A. virginica* which is most common on the open shale barrens may be described as

Var. **argillicola** n. var., a forma typica differt foliis basilaribus obovatis, 6–8 mm. latis, apice obtusis vel breviter mucronatis; foliis caulinis apice acutis vel breviter mucronatis, herbaceis; bracteis involucri masculi oblongis vel ellipticis, obtusis, margine integris, lacteis vel roseis; capillis pappi flosculi masculi dilatatis crenatis; involucro femineo 5.5–7 mm. alto; bracteis 0.4–0.8 mm. latis, exterioribus acutis, interioribus attenuatis, margine integris; achaeniis dense pubescentibus.—Pennsylvania: dry, hilly woods, branch of Turkey Foot Run, Sewickley township, Allegheny County, *J. H. Schafer*, July, 1886 stam. (as *A. neodioica*, Pitt.); Moon township, Allegheny County, *Schafer*, no. 263 pist. (as *A. neodioica*, Pitt.). Maryland: Tonoloway Ridge, Washington County, *Shreve and Jones*, no. 768 pist. (as *A. neodioica*, U. S.). Virginia: shale slope, along Gap Run, east of Hayfield, Frederick County, *G. L. Stebbins Jr.*, no. 1035 stam. (G. L. S.); shale slope, Three Top Mountain, Shenandoah County, *F. W. Hunnewell*, no. 11493, in part, stam and pist. (as *A. neodioica*, F. W. H.); same locality, *S. F. Blake*, nos. 11739 stam. and 11740 pist. (S. F. B.); Bull Pasture Mt., Shenandoah Mountains, *P. A. Rydberg*, no. 9004 stam. (as *A. neodioica*, U. S.); dry shale slope in mountains east of Natural Bridge, *E. B. Bartram*, May 31, 1909, pist. (as *A. neodioica*, Phila.). West Virginia: dry woods and roadsides, in shaly soil, Hanging Rock, Hampshire County, *Earl Core, W. M. Frye, and G. L. Stebbins, Jr.*, no. 1033 stam. (G. L. S.); *W. M. Frye*, nos.

1, 2, 8, 10, stam. and pist. The latter number is the TYPE, in the Gray Herbarium, with a duplicate in the U. S. National Herbarium.

The material from Strasburg, Hanging Rock, and Hayfield is most characteristic, the other specimens show some transition toward the typical form.

In the breadth of its basal leaves, the absence of scarious appendages on the cauline leaves, the entire margins of the involucral bracts, and the densely pubescent achenes, var. *argillicola* resembles *A. neodioica.* Furthermore, the involucre of some pistillate plants equals in height that of typical *A. neodioica.* It may be recognized, however, by the short, narrow cauline leaves, and the narrow involucral bracts, as noted in the chart presented below, as well as its smaller size and more densely corymbose inflorescence. Its exterme form is also distinctive in the rounded basal leaves with very short mucros, and in the rose-colored involucres of the staminate plants. These do not occur regularly in any other of the species of eastern America, although they have been reported for *A. plantaginifolia,*[1] and seen by the writer in an immature plant, probably a form of *A. fallax,* collected in the shale area of Virginia.

This species and variety form an interesting addition to the plants of the Appalachian shale area, as studied by Wherry.[2] He has considered at least two of these, *Trifolium virginicum* and *Senecio antennariifolius,* relic species, descendants of ancestors which were widespread in pre-glacial time. *Antennaria virginica* must also be considered an old species compared to its more familiar relatives. As I have pointed out in a previous paper,[3] the cytological evidence shows clearly that the parthenogenetic species of *Antennaria* have been derived from their nearest relatives among the sexual species. *A. virginica,* with its abundant staminate plants, must be sexually reproducing.[4] *A. neodioica* is known to be parthenogenetic, and shows in its specific characteristics that it has been derived from *A. virginica.* It is larger in all of its parts, and blooms later, while staminate plants are rare. These are precisely the characteristics in which the parthenogenetic *A. fallax, A. occidentalis,* and *A. petaloidea* differ from the sexual *A. plantaginifolia* and *A. neglecta.* In the accompanying chart

[1] R. Peabody, RHODORA **36**: 376. 1934.

[2] Jour. Wash. Acad. Sci. **20**: 43–52. 1929; Proc. Penn. Acad. Sci. **7**: 16–164. 1933.

[3] G. L. Stebbins, Jr., Bot. Gaz. **94**: 338–340. 1932.

[4] Since this has gone to press, bagging experiments, like those described in a previous paper (l. c.) have been performed on *A. virginica.* These had negative results, although bagged, but artificially pollinated inflorescences from the same plants produced a good percentage of mature achenes. This demonstrates that *A. virginica* is sexually reproducing, and not regularly parthenogenetic.

and drawings, the chief characteristics of *A. virginica* and its var. *argillicola* are compared with those of *A. neodioica* and its var. *attenuata*, the two varieties which are common within the range of *A. virginica*.

	A. virginica var. typica	A. virginica var. argillicola	A. neodioica var. typica	A. neodioica var. attenuata
Basal Leaves				
Length	average 18–23 mm.	average 15–20 mm.	average 27–33 mm.	average 24–30 mm.
Breadth	av. 4–6 mm.	av. 6–8 mm.	av. 8–9 mm.	av. 9–10 mm.
Apex	acute mucro over 0.5 mm.	obtuse mucro less than 0.5 mm.	obtuse mucro about 0.5 mm.	acute mucro over 0.5 mm.
Cauline Leaves				
Length	average 10–13 mm.	average 11–13 mm.	average 16–19 mm.	average 16–19 mm.
Breadth	1–1.8 mm.	1–2 mm.	2–3 mm.	2–3.5 mm.
Apex	acuminate sometimes scarious	acute	acute	acute-acuminate
Staminate Involucre				
Height	3.8–5 mm. average 4.5	3.8–5 mm. average 4.5	5.5–6.5 mm. average 6	5.5–6.5 mm. average 6
Shape of bracts	elliptic acute	broad-elliptic obtuse	broad obtuse	elliptic obtuse-acute
Pistillate Involucre				
Height	5–6.5 average 6	5–7 average 6.2	6.2–7.5 average 7.2	7–8 average 7.5
No. of bracts	25–35	25–35	35–50	30–40
Apex of bracts	obtuse-acute erose	acute-acuminate, entire	obtuse-acute entire	acute-attenuate slightly erose
Width of outer bracts	0.8–0.9 mm.	0.7–0.8 mm.	1.1–1.4 mm.	0.9–1.1 mm.
No. of florets	40–65	40–70	70–140	50–100
Pistillate Florets				
Length of corollas	3.2–4.2 mm. average 3.6	3.5–4.5 mm. average 3.8	4–5 mm. average 4.2	4.2–5.2 mm. average 4.7
Apex of corollas	mostly regular	irregular	regular	irregular
Pappus hairs	remotely barbellate	closely barbellate	closely barbellate	remotely barbellate
Pits of Receptacle	shallow 0.2 mm. ridges blunt	shallow 0.2 mm. ridges thin, sharp	deep 0.25 mm. ridges blunt	deep, 0.25 mm. ridges thin, sharp

In computing the size of the basal leaves, measurements were taken from the largest leaves of well developed rosettes. The middle cauline leaves only are included in the measurements. The corolla measurements do not include the styles. The apex of the pistillate corolla is considered regular when, as in FIG. 3, its opening is horizontal or nearly so, and the hairs fringing it are about equal in length,

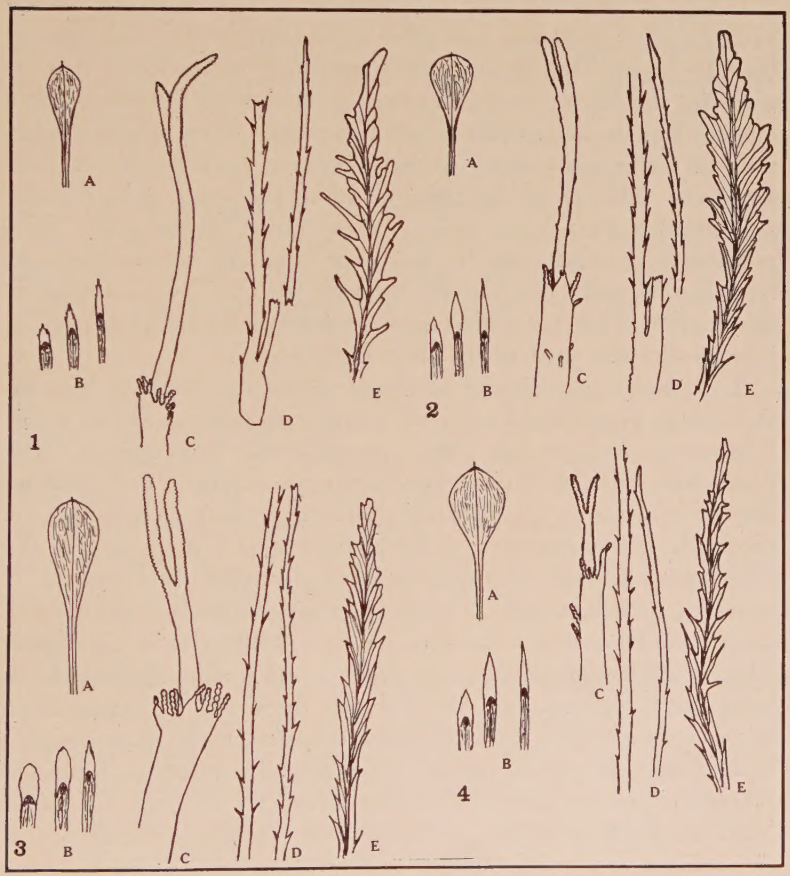


Fig. 1, ANTENNARIA VIRGINICA: A, basal leaf, × 4/5; B, outer, middle and inner involucral bracts, × 2; C, apex of corolla of pistillate floret, × 30; D, base and apex of pappus-hair of pistillate floret, × 30; E, apex of pappus-hair of staminate floret, × 30.

Fig. 2 (A, B, C, D and E), A. VIRGINICA var. ARGILLICOLA, same magnifications.

Fig. 3 (A, B, C, D and E), A. NEODIOICA var. TYPICA, same magnifications.

Fig. 4 (A, B, C, D and E), A. NEODIOICA var. ATTENUATA, same magnifications.

and irregular when, as in FIG. 4, the opening is oblique, or notched, with the hairs markedly unequal in length, and usually a few are situated on the upper part of the limb. FIG. 2 illustrates the closely barbellate pappus hairs of *A. virginica* var. *argillicola*, while the remotely barbellate hairs of *A. neodioica* var. *attenuata* are shown in FIG. 4. From this chart the fact is apparent that the two varieties of *A. neodioica* show different combinations of the characters of the varieties of *A. virginica*, and differ consistently from them only in their larger size throughout. The probability is, therefore, that *A. neodioica* and its var. *attenuata* arose, by increase in the chromosome number and the acquisition of parthenogenesis, from different intermediate forms, presumably hybrids, between *A. virginica* and var. *argillicola*. They probably originated during the period of the Wisconsin glaciation and, due to their greater vigor, ("hybrid vigor" perpetuated by parthenogenesis), and their rapid and certain means of reproduction, advanced over the territory left open by the retreat of the ice sheet, while the parent species remained, for the most part, in its original home south of the limit of glaciation.

A. neodioica var. *grandis* has basal leaves intermediate between those of *A. virginica* and those of *A. plantaginifolia*, and in its looser inflorescence and numerous heads resembles the latter species. The floral characteristics of these three forms are so nearly alike that no definite conclusions can be made concerning them, except that, as expected, *A. neodioica* var. *grandis* is larger in all of its parts than the other two. *A. neodioica* var. *grandis* usually differs from typical *A. neodioica*, as well as from *A. virginica* in the shortness of the hairs at the apex of its corolla, a character which it shares with *A. plantaginifolia*. Furthermore, wherever *A. virginica* and *A. plantaginifolia* have been found together, *i. e.*, at Hanging Rock and at Strasburg, a series of intermediate forms has been collected, which show sterility in the form either of minute and shrunken pollen grains or shrivelled achenes. Some of these intermediate forms (*W. M. Frye*, nos. 1034, 1037, 35, 36; *S. F. Blake*, no. 11732,) are practically identical with *A. neodioica* var. *grandis* except for their small size. There is a complete series of gradations from *A. virginica* to these intermediate forms, just as there is from *A. neodioica* to var. *grandis*. Hence *A. neodioica* var. *grandis* probably originated from these partially sterile hybrids in the manner previously described. Although var. *grandis* is primarily of a more northerly range, I have seen one specimen (Moon Township, Alleghany County, Pennsylvania, *J. H. Schafer*, no. 262)

clearly of this variety, within the range of *A. virginica*, and some of Frye's collections approach it.

The other two recognized varieties of *A. neodioica*, vars. *chlorophylla* and *interjecta*, are more difficult to explain. Var. *chlorophylla* shows a transition toward *A. canadensis*, not only in the green and glabrous upper surface of its leaves, but in the shape of its basal leaves and of the involucral bracts as well, although agreeing with *A. neodioica* in the absence of appendages on the upper cauline leaves, the height of the involucres, and the length of the corollas. If a plant can be found, and certain specimens that I have seen lead me to believe that it exists, which is the sexual counterpart of *A. canadensis* just as *A. virginica* is of *A. neodioica*, then the origin of both *A. canadensis* and *A. neodioica* var. *chlorophylla* could be explained in the same manner as that of the other eastern American species.

Var. *interjecta* is transitional toward *A. rupicola*, a species which, along with *A. gaspensis*, was formerly considered a variety of *A. neodioica*, but whose specific identity is now clearly understood.[1] Both of these latter species are relic endemics of the region about the Gulf of St. Lawrence, except for the isolated occurrence of *A. rupicola* in the Great Lakes region, and show certain resemblances toward some of the Cordilleran species of Antennaria. The likelihood is, therefore, that they have existed since the period before the Wisconsin glaciation, and were evolved at a time when the eastern and the western species of *Antennaria*, now isolated from each other, were mingling together. If this is so, then *A. neodioica* var. *interjecta*, also a relic endemic, of the region about Bic, Que., may be considered a member of this series which approaches more nearly *A. neodioica* and therefore *A. virginica*.

The existence of *Antennaria virginica* is, therefore, further evidence in favor of the hypothesis that the parthenogenetic species of *Antennaria* originated from the sexual species by a process including an increase of the chromosome number and often hybridization.

Colgate University.

[1] Cf. M. L. Fernald, Rhodora 35: 341–343. 1933.

CRITICAL PLANTS OF THE UPPER GREAT LAKES REGION OF ONTARIO AND MICHIGAN

M. L. FERNALD

(*Continued from page 222*)

CRYPTOGRAMMA CRISPA AND C. ACROSTICHOIDES (PLATES 356 and 357).—Having occasion to check as closely as possible the range of the dimorphic fern which in America passes as *Cryptogramma acrostichoides* R. Br. I have become increasingly perplexed to find satisfactory characters to separate it as a species from the European *C. crispa* (L.) R. Br. and the Asiatic *C. Brunoniana* Wallich.

The difficulty is an old one. Robert Brown set up the genus *Cryptogramma*, basing it on the plant brought back by Richardson from the Nelson or the Mackenzie drainage-systems: "In shady rocky woods, between lat. 56° and 60° north. (First found by Mr. Menzies at Nootka Sound)"[1]; but he also included doubtfully with it in the genus the *Pteris crispa* (L.) All., the plant now called *C. crispa* (L.) R. Br. and confined to Europe and adjacent Asia, saying that the European plant differs in having the sori shorter and more rounded, the American with them linear: "Typus generis est Cryptogramma acrostichoides, sed character constructus pro receptione Pteridis crispae *auctor.* quae equidem species, ob soros abbreviatos potius subrotundos quam lineares, venulas terminantes sinum feré involcri occupantes et cito confluentes, tunc aemulantes sorum linearem continuum costae parallelum Pteridis, cum cujus speciebus pinnulis angustatis involucro omnino tectis, habitu bené satis convenit." Kaulfuss, in 1824, reduced *Cryptogtramma acrostichoides*, with doubt, to *Allosorus crispus* (L.) Bernh., basing his reduction on examination of Chamisso's material from Unalaska.

In 1829 Hooker republished Brown's account of *Cryptogramma acrostichoides*, citing first the Menzies collection from Nootka Sound, followed by that of Richardson from the Nelson or the Mackenzie area, and showing typical *C. acrostichoides* in one of Greville's beautiful plates,[2] here reproduced as our PLATE 356. Referring to Robert Brown's doubt as to the generic identity of the American and the European plants, Hooker said: "To us, however, there appears no generic difference; and the fertile fronds have the closest similarity, in almost every particular, except in the rather shorter *sori* of *capsules*.

[1] R. Br. in Richardson, Frankl. Journ. App. ed. 1: 754, repr. 26, and 767, repr. 39 (1823).

[2] Hook. & Grev. Ic. Fil. i. t. xxix (1829).

In the sterile fronds the pinnules are much broader and never wedge-shaped, in the plant [*C. acrostichoides*] now before us."

Two years later, with a plate (t. clviii), here reproduced as our PLATE 357, Hooker took up a manuscript name of Wallich's for a plant of alpine summits of the Himalayas and published as a new species *Cryptogramma Brunoniana*.[1] The plate of it (our PLATE 357), except for the right-hand sterile frond, might have been drawn from the type-collection of *C. acrostichoides* (our PLATE 356). Note the very similar pinnules of the sterile frond on the left, of *C. Brunoniana*, and those of the Greville plate of *C. acrostichoides*, the essentially identical fertile fronds, the venation of the inrolled pinnules, the enlarged sori and the spores. Although Hooker, following Wallich, intended to compliment Robert Brown in the specific name, the dedication had mixed values:

> Amongst the extensive and valuable collection . . . made by Dr. Wallich . . . , few have given us more pleasure than a species of *Cryptogramma*,—the subject of the present plate,—which was detected on the lofty "Kumaun," a part of the great range of the Himala mountains, by Robert Blinkworth. . . . And this too, though from so very remote a country, is yet *almost* identical with that of Nootka Sound and Subarctic America. The only difference exists in the sterile fronds . . .
>
> Dr. Wallich accompanied the specimens with the remark, "Dedicavi speciem conditori generis immortali, amico aestimatissimo": and we think ourselves honoured in being permitted to give publicity to so interesting a plant, which bears the name of the greatest Botanist of this or any other age or country.

Hooker's dedication, recalling Humboldt's gracious tribute to Robert Brown as "botanicorum facile princeps" everyone could applaud; but, unfortunately, the specific value of *Cryptogramma Brunoniana* was soon doubted by Hooker himself. In his most scholarly work on the ferns, Species Filicum, Hooker in 1858, taking the unjustifiable liberty of changing Brown's *Cryptogramma* to *Cryptogramme*, went further. He boldly reduced both *C. acrostichoides* and *C. Brunoniana* to mere FORMS of the European *C. crispa*. His revocation of the Asiatic and the American species was clearly stated:

> In taking the bold step to unite several supposed species into one, as I have here done, contrary to the judgment of the most distinguished botanists, it is necessary that I offer explanation, especially when, in conjunction with my friend Dr. Greville (Icones Filicum), I published as distinct two of the species I propose to abolish, viz. the N. American *C. acrostichoides*, Br., and the Northern Indian *C. Brunoniana*, Wall. I would however call attention to the remark made, firstly, under *C. acro-*

[1] Wallich in Hook. & Grev. Ic. Fil. ii. t. clviii (1831).

stichoides: "Mr. Brown has drawn up the character of the genus so as to include our *Pteris crispa*, which he nevertheless considers a doubtful species of *Cryptogramme*. To us, however, there appears no generic difference; and the fertile fronds have the closest similarity in almost every particular except the shorter sori (in *C. crispa*). In the sterile fronds the pinnules are much broader, and never wedge-shaped in the plant before us (*C. acrostichoides*)." Under *C. Brunoniana* we observed, "This, though from so remote a country (Himalaya), is yet almost identical with that of Nootka Sound and subarctic America (*C. acrostichoides*); the only difference exists in the sterile fronds," &c. If indeed there was a manifest difference in the sori, so as to constitute different genera, between *C. crispa* and *C. acrostichoides* and *Brunoniana*, as Presl, and lately Mettenius, maintain is the case, the first could upon no account be united with the two latter; but I think I may appeal to the magnified representations of the sori of *C. crispa*, as given in our 'Genera Filicum' and in Fée's 'Genera Filicum,' and of those of the two kinds in the 'Icones Filicum,' in support of my views that there is no available distinction; and I have copious specimens before me at this moment of our British species (*C. crispa*), in proof that, as in *C. acrostichoides*, these sori occupy so much of the veins, and are "ita approximati, ut discus totus pinnulae explanatae capsulis maturis tectus est, et in hoc stadio filix species *Grammitidis* vel *Acrostichi* quasi evadit," *Br.* Our specimens, gathered in an advanced state in Galloway, Scotland, have the involucres quite spreading, and exposing the sori occupying nearly the whole veins.

When an old plant is found in a very distant part of the world from its previously known locality, one is apt to look upon it as something new; and, as is the case with the Cedar of Lebanon and the Cedar of Himalaya, it is very difficult to remove the impression once made upon the mind, although no tangible character to distinguish them can be detected.

I shall now consider the different variations or forms of our plant, as much as possible under their respective countries, for I allow that the mass of specimens from Europe, Asia, and America, exhibit some slight differences, often not easily defined.[1]

Under his *Cryptogramma crispa*, forma *europaea* he continued

Notwithstanding that our learned friend, Mr. Brown, framed his character of *Cryptogramme* with a view to include our *C. crispa*, "quae dubia quidem species, ob soros abbreviatos potius subrotundos quam lineares," we are disposed to consider it by no means generically distinct, and not even specifically so, either from that gentleman's *C. acrostichoides*, or from the *C. Brunoniana* of Dr. Wallich. It is true that the chief distinction between the plant now under consideration and the two latter is, that *C. crispa* has often the fertile pinnules when mature narrower, with smaller or shorter sori and fewer sporangia, but that is very variable in different specimens, and these sori do not extend and become so completely confluent over the back of the pinnules as generally to force back the involucres, and thus to present a broader surface of pinnule, as is more or less common to the other two kinds; but this is a character not unlikely to depend on soil and climate, and which, in other Ferns, would not be considered of specific, much less of generic value. Another peculiarity in this state of *C. crispa* is, that its habit is more slender than

[1] Hook. Sp. Fil. ii. (pt. v.) 127, 128 (1858).

CRYPTOGRAMMA CRISPA, var. ACROSTICHOIDES (*C. acrostichoides*, after Hooker & Greville).

CRYPTOGRAMMA CRISPA, var. BRUNONIANA (*C. Brunoniana*, after Hooker & Greville).

the continental forms, though even this is by no means universal; some of our specimens are very stout and firm.

Under forma *indica* (*C. Brunoniana*) he made the further note

I place this variety next to the European form, because, in the aggregate of specimens before me, the sterile fronds are exactly as in our European plant, that is, of two kinds, the one kind with the obovate segments deeply divided, serrated, single-nerved, the other with the pinnules elliptical, deeply serrated and pinnatedly veined, whereas the fertile pinnules more resemble those of the following (American) form, although they are not quite so large; but, while the majority of the Indian specimens are as here described, there are others that are more slender and flaccid, with fronds and narrower fertile pinnules, in short, in all particulars resembling our own native specimens.

And in discussing the American plant, his *C. crispa*, forma *americana* (*C. acrostichoides*), Hooker, citing the material of Richardson, Menzies and Douglas, said "The specimens from these stations may be considered the types of the *C. acrostichoides*, Br., and were the first recognized specimens referred to *Cryptogramme;* and they all have the broad, flattened, mature, fertile pinnules, the generally elliptical, rigid, sterile ones." Continuing, he cited the collections from southern Alaska (of Ruprecht, Barclay, Chamisso and Mertens) and made the significant note: "all these, and specimens just received (March, 1857)[1] from J [I]. A. Lapham, Esq., gathered on Isle Royale, Lake Superior, by W. D. Whitney, Esq.,—the only locality known within the United States,—possess quite the European form."

Somewhat earlier, in 1845, Ruprecht,[2] reducing *Cryptogramma* to *Allosorus*, recognized four species in the series now under discussion: *A. crispus* (L.) Bernh. of Europe; *A. fovcolatus* Rupr., a renaming, in part, of *Cryptogramma acrostichoides* R. Br., the species said to have the fruiting fronds "valde similis A. crispo," but the sterile coriaceous and opaque, less dissected and with the margins of the upper surfaces strongly foveolate; *A. sitchensis* Rupr. from Sitka, with fronds more divided than in *A. fovcolatus* and the foveae not apparent; and *A. Brunonianus* (Wall.) Rupr., the Himalayan plant which he separated from the two American merely by the mucronate pinnules of the sterile fronds ("differt ab A. foveolato et A. sitchensi pinnulis sterilibus mucronatis"). In this connection it should be noted that the conspicuous foveae emphasized by Ruprecht for the commoner American series were specially shown in Greville's plate of the type of *Crypto-*

[1] This item, "March, 1857," is of special significance in view of the date printed on the title-page, "1851."

[2] Rupr. Distrib. Crypt. Vasc. Imp. Ross. in Beitr. Pflanzenk. Russ. Reich. iii. 46, 47 (1845).

gramma Brunoniana. Ledebour[1] accepted Ruprecht's treatment but separated the American plants from the European as a section on the character alleged by Brown, the reputed difference in position of the sori, a "distinction without a difference," as pointed out by Hooker and several later students.

In 1867, without further comment, Hooker & Baker treated[2] *Cryptogramma* as a monotypic species, *C. crispa* R. Br. with two varieties: "β, *C. Brunoniana,* Wall." and "γ, *C. acrostichoides,* R. Br." And other European and Asiatic students of the ferns have expressed similar views. Thus, in 1867, Milde, retaining these plants in *Allosorus,* treated them as one species: *A. crispus* (L.) Bernh., with var. *acrostichoides* (R. Br.) Milde[3] and var. *Brunonianus* (Wall.) Milde. Var. *acrostichoides* was separated along the already emphasized lines, with the addition of the darker median band of the scales ("A forma europaea haec forma differt lamina sterili subcoriacea et segmentis ultimatis ovalibus crenatis, paleis medio coloratis"). However, an Alaskan specimen showed uniformly colored scales and one from the arid subalpine region of Spain had the foliage of the American plant, while even in Silesia plants transitional between the European and American were found ("Formae quae transitum ab europaea ad americanam significant, etiam in Silesia inveni [with citation of illustrations]. Sed multo copiosiores sunt formae ad Brunonianam spectantes, . . . Specimina Kadjakiana [from Kadiak Island, Alaska] paleis fere semper concoloribus, rarissime striolatis gaudebant. In Hispania . . . cl. *Lange* in regione subalpina specimina pusilla Allosori crispa legit, quorum segmenta ultima omnino formam hujus varietatis 'acrostichoides' habent"). Finally, Milde pointed out that the most significant difference is the presence of the conspicuous foveolae on the upper surfaces of the sterile pinnules in vars. *acrostichoides* and *Brunoniana* ("Quam levis momenti foveolae illae in pagina superiore varietatis *acrostichoidis* sint, ex hoc intelligendum est, quod eae quoque in varietate *Brunoniana* saepissime observandae sunt").

In 1880 in his *Review of the Ferns of Northern India,* C. B. Clarke was definite. Reducing *C. acrostichoides* and *C. Brunoniana* to *C. crispa* he said: "I can see no difference between the Himalayan and European plants, nor can I distinguish any Himalayan variety. Milde says the Himalayan form has the barren fronds with the ultimate segments

[1] Ledeb. Fl. Ross. iv. 525 (1853).
[2] Hook. & Bak. Synop. Fil. 144 (1867).
[3] Milde. Fil. Eur. et Atl. 24–26 (1867).

more acutely serrate; but I suspect Milde's stock of Himalayan material on which he ventured this distinction was small. I have collected the plant more than twenty times between Dhurmsala and the Karakorum. None resemble the American var. *acrostichoides*."[1]

In 1881, James Britten made an inconclusive but rather strong argument[2] for uniting all three as one species; in 1884, Boissier definitely treated[3] them all as one. In 1897 Christ[4] made short shrift of the question, treating *Cryptogramma crispa* as a species without varieties, occurring in Europe, Asia and North America; but in 1910[5] he wrote of the Asiatic and the North American plants as "Subspezies: *C. Brunoniana* . . . und in einer dritten: *C. acrostichoides*." In 1907, Hegi, likewise, united[6] them all as one species with Himalayan and American varieties. The latest European estimate of the three comes from Christensen in 1927. Writing of the Kamtchatkan plant, he calls it the American *C. acrostichoides*, but with the pertinent note:

> The beautiful specimens agree closely with the species quoted above, which was previously not known from Asia. The differences between it and the European *C. crispa* are so small that I am inclined, like MILDE, to consider it a variety of *C. crispa*. Specimens collected, for instance, at Lofoten (Svolvaer), without doubt belonging to *C. crispa*, can scarcely be distinguished from *C. acrostichoides*. The best characters of this species show the basal scales, which are dark-brown in the centre (in *C. crispa* concolorous) and the small pits (faveolae — conf. the syn. *Allosurus faveolatus* RUPR.) on the upper side of the lamina above the tips of the veins; they are probably to be found only in dried specimens.[7]

In American treatments I find little or no reflection (except by George Lawson, whose viewpoint was essentially European) of the judgments of Hooker, Milde, Clarke and Christensen, that *Cryptogramma acrostichoides* is a geographic variety of *C. crispa*. With the works of Hooker and of Milde before him D. C. Eaton wrote, in 1880, of the American *C. acrostichoides* and the European *C. crispa:*

> The two plants are in fact so nearly allied that Hooker and Milde have considered the American only a variety of the European, and Hooker said that some of the Scottish specimens in his collection were almost identical with those from North America, and that he had some from the United States and from British Columbia quite agreeing with the common European form. While it is indisputable that there may be specimens from one continent much resembling the type usually seen in the other,

[1] C. B. Clarke, Trans. Linn. Soc. ser. 2, Bot. i. 459, 460 (1880).
[2] Britten, Europ. Ferns, 57–63 (1881).
[3] Boissier, Fl. Orient. v. 726 (1884).
[4] Christ, Farnkr. der Erde, 157 (1897).
[5] Christ, Geogr. der Farne, 123 (1910).
[6] Hegi, Ill. Fl. Mitteleur, i. 36 (1907).
[7] Christensen in Hultén, Fl. Kamtch. and Adj. Isl. i. 43 (1927), where Christensen unjustifiably altered the spelling of *Allosorus foveolatus* to *A. faveolatus*.

yet the normal type of *C. acrostichoides* is so different from that of *C. crispa*, that, for the present purpose certainly, it is better to keep them apart.[1]

Eaton's treatment of the admittedly confluent plants of the two continents as two species, in spite of the inconstancy of the characters, has, apparently, been quite satisfactory to all American botanists. I can find no American treatment (except Lawson's in 1889) of it as a variety of *Cryptogramma crispa*. This is perhaps due to lack of sufficient Old World material for proper comparisons in many American herbaria or merely to the fact that attention has not been focussed on the question. We freely admit other circumboreal types, even though the American plants may often show well defined varietal differences: *Botrychium Lunaria, Cystopteris fragilis, Thelypteris Phegopteris* and *T. fragrans, Polystichum Lonchitis* and *P. Braunii, Athyrium Filix-femina* and *alpestre, Asplenium viride* and *septentrionale, Phyllitis Scolopendrium, Lycopodium annotinum, Selaginella selaginoides* and many others. Why, in view of the evidence, discriminate against *Cryptogramma crispa?*

The preceding summary of the conclusions of Hooker, Milde, Clarke, Christensen and others regarding the breaking down of specific lines between *Cryptogramma crispa*, at one end of the series, and *C. acrostichoides* at the other, was prepared after a personal study of the material had convinced me of the specific identity. In my own study of the material I had detected and correlated the characters which, to my great satisfaction, I find that others before me and with a tremendous advantage of experience and fuller material have already pointed out. The disrupted range (map 12) of the aggregate species, *C. crispa*, is such as to indicate that its geographic segregation was an early one. The three geographic varieties are indicated in the following synopsis.

Sterile fronds submembranaceous to subcoriaceous, when dry translucent to transmitted light, clearly displaying the nerves; nerve-tips not conspicuously foveolate; pinnules chiefly cuneate at base and deeply cleft: fertile fronds quadripinnate to bipinnate, with 35–200+ pinnules 0.2–1 cm. long: basal scales mostly concolorous, pale to full brown . . . . . *C. crispa*, var. *typica*.

Sterile fronds chartaceous to coriaceous, opaque; nerve-tips (at least in dried specimens) conspicuously foveolate: fertile fronds bipinnate or tripinnate, with 25–115 pinnules 0.2–2 cm. long: basal scales mostly with median castaneous center, or concolorous.

Some or all of the sterile fronds with cuneate-obovate or subflabelliform deeply cleft pinnules: fertile pinnules 25–85, 0.2–1.1 cm. long; basal scales mostly pale and concolorous. Var. *Brunoniana*.

[1] D. C. Eaton, Ferns of N. Am. ii. 102 (1880).

Photo. E. C. Ogden.

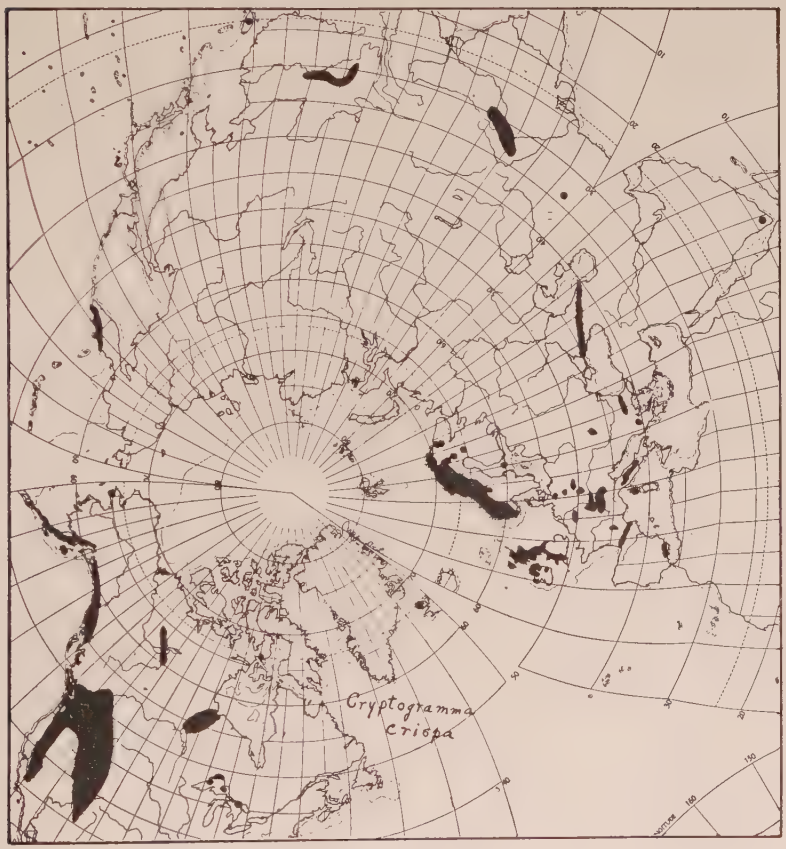
PTERIDIUM AQUILINUM, var. LANUGINOSUM, forma DECIPIENS, × 3/5, from Quebec.

Photo. E. C. Ogden.

Festuca ovina and Allies in eastern America: figs. 1 and 2, F. ovina; 3 and 4, F. ovina, var. duriuscula; 5 and 6, F. saximontana; 7 and 8, F. brachyphylla; 9, F. supina; 10 and 11, F. vivipara; 12 and 13, F. capillata; panicles, × 1; spikelets, × 5.

All the sterile fronds with oblong or narrowly ellipitic crenate to incised pinnules: fertile pinnules 25–115, mostly 0.4–2 cm. long: basal scales mostly with casteneous centers. . . . . Var. *acrostichoides*.

C. CRISPA (L.) R. Br., var. **typica**. *Osmunda crispa* L. Sp. Pl. ii. 1067 (1753). *Pteris crispa* (L.) All. Fl. Pedem. ii. 284 (1785). *Acrostichum crispum* (L.) Vill. Hist. Pl. Dauph. iii. 838 (1789). *Polypodium crispum* (L.) Roth, Usteri Neu. Ann. ii. 10 Stück. 56 (1794).



MAP 12. World-Range of CRYPTOGRAMMA CRISPA.

Onoclea crispa (L.) Hoffm. Deutschl. Fl. ii. 11 (1795). *Allosorus crispus* (L.) Bernh. in Schrad. Neu. Journ. 1^2. 36 (1806). *Blechnum crispum* (L.) Hartm. Handb. Skand. Fl. 372 (1820). *Stegania onocleoides* S. F. Gray, Nat. Arr. Brit. Pl. ii. 16 (1821). *Phorolobus crispus* (L.) Desv. Prodr. 291 (1827). *Struthiopteris crispa* (L.) Wallr. Fl. Cr. Germ. i. 27 (1831). *C. crispa* (L.) R. Br. in Richardson, Frankl. Journ. App. ed. 1: 767, rep. 39 (1823) by implication but without

transfer; Hook. & Bauer, Gen. Fil. t. cxv B (1842), where ascribed to Brown.—Europe and adjacent Asia.

Var. **Brunoniana** (Wallich), comb. nov. *C. Brunoniana* Wallich in Hook. & Grev. Icon. Fil. ii. t. clviii (1831); Beddome, Ferns Brit. Ind. t. clxiv (1868). *Gymnogramma Brunoniana* (Wall.) Presl, Tent. 219 (1836). *Allosorus Brunonianus* (Wall.) J. Smith, Journ. Bot. iv. 49 (1841). *Phorolobus Brunonianus* (Wall.) Fée, Gen. 131 (1850–52). *C. crispa,* forma *indica* Hook. Sp. Fil. ii. 129 (1858). *C. crispa,* β, *C. Brunoniana* (Wall.) Hook. & Baker, Syn. Fil. 144 (1867). *Allosorus crispus,* var. *Brunonianus* (Wall.) Milde, Fil. Eur. et Atl. 25 (1867). *C. crispa,* subsp. *C. Brunoniana* (Wall.) Christ, Geogr. der Farne, 123 (1910).—Alpine regions of the Himalayas; mountains of southern China; ? Japan. A few specimens, not wholly characteristic and with the castaneous scales and other characters transitional to the next, in southern Alaska, are referred as transitional to the next. They may include Ruprecht's proposed species. Plate 357.

Var. acrostichoides (R. Br.) C. B. Clarke, Trans. Linn. Soc. ser. 2, i. 460 (1880); Lawson, Fern Fl. Can. 236 (1889). *C. acrostichoides* R. Br. in Richardson, Frankl. Journ. App. ed. 1: 754, repr. 26, 767, repr. 39 (1823); Hook. & Grev. Ic. Fil. t. xxix. (1831); D. C. Eaton, Ferns N. Am. ii. 99, t. lix. figs. 1–5 (1880); Christensen in Hultén, Fl. Kamtch. and Adj. Isl. i. 43 (1927). *Allosorus foveolatus* Rupr. Distr. Crypt. Vasc. Imp. Ross. in Beitr. Pflanzenk. Russ. Reich. iii. 46 (1845). *A. sitchensis* Rupr. l. c. 47 (1845). *C. crispa,* forma *americana* Hook. Sp. Fil. ii. 130 (1858). *C. crispa,* γ, *C. acrostichoides* (R. Br.) Hook. & Baker, Syn. Fil. 144 (1867). *A. crispus,* var. *acrostichoides* (R. Br.) Milde, Fil. Eur. et Atl. 24 (1867). *C. acrostichoides,* forma *foveolata* (Rupr.) Gilbert, List N. Am. Pterid. 16 and *C. acrostichoides foveolata* (Rupr.) Gilbert, l. c. 36 (1901), the latter repeatedly spoken of as "a variety," and "this variety," although on the earlier page it was called a forma! *C. crispa,* subsp. *C. acrostichoides* (R. Br.) Christ, Geogr. der Farne, 123 (1910).—Kewatin to Alaska and Kamtchatka, south, locally, to islands of Lake Huron, Ontario, of Lake Superior, Ontario and Michigan, and along the mountains to New Mexico and southern California. Plate 356.

In its very thick and opaque fronds, as compared with the submembranaceous and translucent fronds of the European *Cryptogramma crispa,* our var. *acrostichoides* shows the result of long-continued growth in the drier region of North America as contrasted with the generally more humid western Eurasia. Var. *acrostichoides* is stated to grow in Labrador (Britton & Brown); and Macoun (Cat. Can. Pl.) seems to quote Hooker as assigning it to "Rocks along the Arctic coast from Mackenzie River to Baffin Bay." I have not seen it from Labrador nor from within the Arctic Circle, nor can I trace Macoun's statement ascribed to Hooker. Ostenfeld did not know of it in Flora Arctica; neither did Simmons in his extensive studies of the Arctic

American flora. European authors have designated some other and later Old World varieties, which I have not been able to study; also one from Chile, which is open to serious doubt.

Pteridium aquilinum (L.) Kuhn. var. **lanuginosum** (Bong.), comb. nov. *Pteris aquilina*, var. *lanuginosa* Bong. Mém. Acad. St. Pétersb. sér. 4, ii. 176 (1832). *Pteridium aquilinum*, var. *pubescens* Underw. Our Native Ferns, ed. 6: 91 (1900). *Pteris aquilina pubescens* (Underw.) Clute, Fern. Bull. xv. 124 (1907). *Filix-femina aquilina* (L.) Farwell, var. *lanuginosa* (Bong.) Farwell, Am. Midl. Nat. xii. 290 (1931).

When Underwood published *Pteridium aquilinum*, var. *pubescens* in 1900 he was working under one of the so-called American rules which rejected a name if it repeated one ever used under the genus in any category. Consequently, since there had been a *Pteris lanuginosa* Bory (1810), Underwood rejected Bongard's varietal name (1832). Under the International Rules the latter must be retained.

Pteridium aquilinum, var. *lanuginosum* is the common bracken of western North America, from Alaska to California, Arizona, New Mexico and the high mountains of western Texas, south along the mountains to Guatemala, with an eastward extension into the Black Hills of South Dakota. East of the Black Hills it is highly localized: on the Gaspé Peninsula, where the cordilleran relationship is well known, the Gaspé plant being the basis of Lawson's *Pteris aquilina*, γ. *decipiens;* on the serpentine slopes and high crests near Black Lake, Megantic Co., Quebec (*Fernald & Jackson*, nos. 11,690 and 11,691), a region famous, also, for its remarkably localized relic-colonies of cordilleran plants (*Adiantum pedatum*, var. *aleuticum* Rupr., *Pellaea densa* (Brack.) Hook., *Festuca scabrella* Torr., etc.); and at Tobermory, at the tip of the Bruce Peninsula, another area famous for its isolated colonies of apparently relic species. Its other area eastward is in northern Michigan. The following Michigan specimens are in the Gray Herbarium: shore of Lake Superior, *C. T. Jackson;* Mackinac Island, *C. F. Wheeler*, no. 85; openings and thickets back of West Bluff, Keweenaw Co., *Fernald & Pease*, no. 3033. In the Gray Herbarium there are specimens reputed to come from New Jersey and Pennsylvania; their data, entered second-hand, is open to grave doubt. See p. 205

The plant described by Lawson from Gaspé as *Pteris aquilina*, γ *decipiens* is a remarkable form. Conventially, *Pteridium aquilinum* is characterized by its conspicuously deltoid frond. Lawson's account of his remarkable plant follows.

Pteris aquilina, Linn. . . . *γ. decipiens.*—Frond bipinnate, thin and membranous, lanuginose, pinnules pinnatifidly toothed, or, in small forms, entire, barren; L'Anse à Cabièlle, Gaspé, John Bell, B. A. This is a very remarkable fern, resembling a Lastrea, and in the absence of fructification, it is doubtfully referred to *Pteris aquilina*, yet the venation seems to indicate that it belongs to that species. . . . Being at a loss what to make of this fern, I sent it to Mr. D. C. Eaton, M. A., who is justly looked up to by American botanists as our best authority on American ferns, and he likewise failed to recognize it. I hope some visitor to Gaspé will endeavuor to obtain it in a fertile state, and thus relieve the doubt.*

* Since the above was written, I have had an opportunity of studying the forms and development of *Pteris aquilina*, and am quite satisfied that the doubtful plant is a state of that species, not old enough to be fertile.

Although Lawson's hope that some one would secure fertile plants from Gaspé of his *Pteris aquilina*, γ. *decipiens* was not fulfilled before his death, material (PLATE 358) which, unquestionably, belongs with it was collected by my former student, Dr. H. B. Jackson, and myself near the crest of Caribou Hill in Megantic Co., Quebec. There, as already noted, it is associated with a remarkable assemblage of relic-colonies of cordilleran plants. It is, therefore, significant that the Caribou Hill plant should have the ciliate indusium and the pubescence which characterize the cordilleran *Pteridium aquilinum*, var. *lanuginosum*. Another number from Caribou Hill is less unlike typical var. *lanuginosum*. It is, therefore, better to treat the plant with bipinnate fronds "resembling a Lastrea" as a form rather than as a true geographic variety. Mr. Ogden has photographed two of the fronds, × 3/5, of the fertile material from Caribou Hill (PLATE 358). Their superficial resemblance to *Thelypteris* (*Lastrea*) *marginalis* (L.) Neiuwl. is apparent. This form should be called

PTERIDIUM AQUILINUM, var. LANUGINOSUM, forma **decipiens** (Lawson), comb. nov. *Pteris aquilina*, γ. *decipiens* Lawson. Edinb. New Phil. Journ. n. s. xix. 110 (1864).—reprinted as Syn. Canad. Ferns and Filic. Pl. 11 (1864). Known only locally in Quebec. PLATE 358.

LYCOPODIUM SELAGO L., var. PATENS (Beauv.) Desv. MICHIGAN: glades and openings in thicket bordering calcareous beach of Lake Michigan, east of Manistique, Schoolcraft Co., no. 3060.

The only Michigan station for *L. Selago* cited by Dodge, is Farwell's in Keweenaw Co. Robbins got typical *L. Selago* in 1863 at Dana Mine, ?Keweenaw Co. (Gray Herb.) and Cooper got it on Isle Royale.

SELAGINELLA SELAGINOIDES (L.) Link. Cited for Michigan by Dodge only from Isle Royale and from Keweenaw Co., Upper Peninsula; reported by Gates & Ehlers from Emmet Co. The following additional stations are represented in the Gray Herbarium from MICHIGAN: Marquette Island, Mackinac Co., August 27, 1913, *W. H.*

Manning; Mackinac, August, 1885, *T. E. Boyce;* shore of Thunder Bay Island, Alpena Co., July 18, 1885, *C. F. Wheeler;* glades and openings in thicket bordering calcareous beach of Lake Michigan, east of Manistique, Schoolcraft Co., no. 3061.

Potamogeton Oakesianus Robbins. Michigan: with *Eleocharis Robbinsii* Oakes, *Utricularia geminiscapa* Benj., *Eriocaulon septangulare* With. and *Drosera intermedia* Hayne in pools in a bog near Rock River, Alger Co., no. 3066.

Reported by Oosting (Pap. Mich. Acad. xv. 159) from a number of counties in the Lower Peninsula and Gogebic in the Upper Peninsula.

Panicum depauperatum Muhl., var. psilophyllum Fern. When I described this glabrous-sheathed variety, Rhodora, xxiii. 193 (1921), I had not seen it from Michigan. The following collections establish its presence on the Upper Peninsula: sandy barrens west of Norway, Dickinson Co., no. 3068; sandy open pine barrens north of Gladstone, Delta Co., no. 3072.

Panicum linearifolium Scribn. The broad range, "Maine to Kansas, south to Georgia and Texas" given by Hitchcock & Chase, excludes the region north of Lake Huron. Our collection from dry gneiss hills, Awrey, Sudbury District, Ontario, no. 3069, is from north of the Lake.

P. linearifolium, var. Werneri (Scribn.) Fern. (*P. Werneri* Scribn.) The range given by Hitchcock & Chase is extended slightly northward. Ontario: dry gneiss hills east of Wasapitei, no. 3070. Michigan: dry, open pine woods, Bête Grise, Keweenaw Co., no. 3071.

P. lanuginosum Ell., var. Lindheimeri (Nash.) Fern. (*P. Lindheimeri* Nash). The northernmost stations cited by Hitchcock & Chase for Ontario and Michigan give no indication that the plant extends into the northern half of the Lake Huron region. The following collections represent this area. Ontario: calcareous gravel by pools, Cloche Peninsula, Manitoulin District, no. 3077; sandy shore of Lake Huron, Algoma, Algoma Distr., no. 3076. Michigan: sandy and stony beach of Lake Huron, south of Alpena, no. 3082.

P. columbianum Scribn. (Including *P. tsugetorum* Nash). The broad range given by Hitchcock & Chase (for *P. tsugetorum*), "Maine to Illinois," etc., excludes northern Ontario and the Upper Peninsula of Michigan. The following collections show its occurrence there. Ontario: dry gneiss hills east of Wasapitei, Sudbury Distr., no. 3073, and dry sandy plains and barrens, Espanola, Sudbury District, nos. 3074, 3075. Michigan: sandy, open pine barrens north of Gladstone, Delta Co., no. 3080.

Oryzopsis canadensis (Poir.) Torr. (*Stipa canadensis* Poir.). Ontario: dry sandy plains and barrens, Espanola, Sudbury Distr., no. 3090. Michigan: dry spruce and pine barren near Humboldt, Marquette Co., no. 3089.

Previously known from east of Georgian Bay and from the north shore of Lake Superior, Ontario.

Stipa spartea Trin. Ontario: sandy shore of Lake Huron, Algoma, Algoma Distr., no. 3092.

Previously known on the southern and eastern shores of Lake Huron as far as the tip of Bruce Peninsula: Tobemory, *Krotkov*, no. 7135.

Melica Smithii (Porter) Vasey. The measurements given by Hitchcock in Gray, Man. ed. 7, should be extended, in view of our new collections from northern Michigan: culms up to 1.5 m. high; blades to 1.5 cm. broad; panicle to 4.3 dm. long; spikelets to 2.4 cm. long (and down to only 1 cm. long). See p. 218 and map 11.

Poa sylvestris Gray. Michigan: woods south of L'Anse, Baraga Co., no. 3111.

Near, if not its northern limit in the state.

The Allies of Festuca ovina in eastern America (Plate 359). —The members of the *ovina* series in eastern North America (separated from the *rubra* series by having the lower sheaths mostly whitish or drab, chartaceous, persistent, not soon disintegrating into fibers; new basal offshoots strongly ascending, from within the sheaths; anthers ¼–½ as long as the palea) are distinguished by the following characters.

a. Lemmas coriaceous to membranaceous, with awns at most 3 mm. long (or wanting); ovaries glabrous; panicles strict, rarely 1 dm. long....*b.*
  b. Awns 1. 3–3 mm. long....*c.*
    c. Panicle loosely open, with divergent short branches during anthesis, oblong to ellipsoid; lemmas coriaceous, strongly involute; anthers 2.5–3 mm. long.
      Culms 1.5–3 (–6) dm. high; leaves 0.4–0.6 mm. in diameter, 5–7-nerved; panicles 2–5 cm. long; spikelets 5–7 mm. long, 3–6-flowered; 2d glume 2.5–4 mm. long; lowest lemma 3–5 mm. long.....*F. ovina.*
      Culms up to 7 dm. high; leaves 0.7–1.2 mm. broad, 7–9-nerved; panicles 4–10 cm. long; spikelets 7–10 mm. long, 4–9-flowered; 2d glume 3.5–5 mm. long; lowest lemma 4.5–6 mm. long.....*F. ovina*, var. *duriuscula.*
    c. Panicle spiciform and close or loosely linear-cylindric to loosely lanceolate; anthers less than 2 mm. long.
      Panicle linear-cylindric or loosely lanceolate, 2–10 cm. long; lemmas greenish, coriaceous, strongly involute; anthers 1.2–1.7 mm. long.....*F. saximontana.*
      Panicle dense, closely spiciform at least above, cylindric to lance-ovoid, usually 1–3 cm. long; lemmas purplish or bronze, membranaceous, tardily, if at all, involute; anthers 0.5–1 mm. long.....*F. brachyphylla.*
  b. Awnless or with awns at most 0.6 mm. long.
    Florets modified into leafy proliferous shoots; 2d glume 3–5 mm. long; lemmas membranaceous, not strongly inrolled, 4–6 mm. long; stamens wanting.....*F. vivipara.*

Florets normal, perfect; 2d glume 2–2.7 mm. long; lemmas coriaceous, tightly inrolled, 3–3.5 mm. long; anthers 1.5–2 mm. long ..... *F. capillata.*

a. Lemmas membranaceous, 5–6.5 mm. long, with awns 2.5–7 mm. long; ovary pubescent at summit; panicle lax, flexuous, mostly 1–2.5 dm. long ..... *F. occidentalis.*

F. OVINA L. Sp. Pl. i. 73 (1753).—Eurasian; introduced in North America, and naturalized in dry soils, from Quebec to western New York and New Jersey. FIGS. 1 and 2.

Forma HISPIDULA (Hack.) Holmb., Scand. Fl. hft. ii. 234 (1926) (*F. ovina*, var. *vulgaris*, subvar. *hispidula* Hack. Mon. Fest. Eur. 87 (1882)) has hispid lemmas.

Var. DURIUSCULA (L.) Koch, Syn. 812 (1857). *F. duriuscula* L. Sp. Pl. 74 (1753).—More frequent, Newfoundland to Minnesota and Pennsylvania. FIGS. 3 and 4.

F. SAXIMONTANA Rydb. Bull. Torr. Bot. Cl. xxxvi. 536 (1909). *F. ovina*, var. *pseudovina* Beal, Grasses, N. Am. ii. 595 (1896), not *F. pseudovina* Hack. (1880). *F. pseudovina* Rydb. Mem. N. Y. Bot. Gard. i. 56 (1900), not Hack. (1880).—Dry crests, hills and sands, western Newfoundland; eastern Quebec; Smugglers Notch, Vermont; shores of Lake Huron, Ontario to British Columbia, south to Michigan, Wisconsin, Minnesota, Nebraska, Colorado and Utah. FIGS 5 and 6.

F. BRACHYPHYLLA Schultes, Man. iii. 646 (1827). *F. brevifolia* R. Br. App. Parry's Voy. Suppl. 289 (1824), not Muhl. (1817). *F. ovina*, var. *brevifolia* (R. Br.) Hack. Bot. Centralb. viii. 406 (1881). *F. ovina brachyphylla* (Schultes) Piper, Contr. U. S. Nat. Herb. x. 27 (1906). *F. supina* Am. Auth., not Schur (1866). *F. ovina supina* Piper, l. c. (1906), in part, not (Schur) Hack. (1881).—Greenland and arctic America, south to bleaker areas of Labrador, northern and western coast and mountains of Newfoundland, Anticosti Island and Shickshock Mts., Quebec, Keweenaw Co., Michigan, and alpine regions to Colorado, Utah, Nevada and California. FIGS. 7 and 8.

Although the arctic-alpine American plant is often passing as the central European *Festuca supina* Schur, it is very different, as worked out in the Gray Herbarium by my former student, now Dr. Ernst Abbe, when identifying his Labrador material. *F. supina* (FIG. 9) has anthers 2–3 mm. long, while the arctic-alpine American plant has them minute (0.5–0.8, rarely –1 mm. long). FIG. 9 is from *Petrak*, Fl. Bohemiae et Moraviae Exsicc. Lfg. VIII. no. 717, from near the type locality of *F. supina.*

F. VIVIPARA (L.) Sm. Fl. Brit. i. 114 (1800); Fernald, RHODORA, xxviii. 151 (1926). *F. ovina*, β, *vivipara* L. Sp. Pl. ed. 2, i. 108 (1762).—Arctic regions, south to mts. of Europe; in America from Greenland and Labrador to northern and western Newfoundland, Anticosti Island and Shickshock Mts., Quebec. FIGS. 10 and 11.

F. CAPILLATA Lam. Fl. Fr. iii. 597 (1778). *F. tenuifolia* Sibth. Fl.

Oxon. 44 (1794). *F. ovina*, var. *capillata* (Lam.) Hack. Bot. Centralb. viii. 405 (1881).—European; indigenous on dry open soil in southern Newfoundland, apparently also in Nova Scotia; introduced and naturalized westward to Michigan and south to Pennsylvania. Figs. 12 and 13.

F. occidentalis Hook. Fl. Bor. Am. ii. 249 (1840); Piper, Contrib. U. S. Nat. Herb. x. 24, pl. viii. (1906). *F. ovina*, var. *polyphylla* Beal, Grasses N. Am. ii. 597 (1896).—British Columbia to California, eastward to western Montana and northwestern Wyoming; woodlands of northern Michigan and adjacent Ontario eastward to Manatoulin Island and Bruce Peninsula.

Piper's diagnostic plate is so good that it is not necessary to illustrate this species.

Agropyron trachycaulum (Link) Malte. Ontario: limestone pavement and gravel, Great Cloche Island, no. 3141.

When I published on this group (Rhodora, xxxv. 170) the typical form of the species was unknown to me from between Lake Superior and the lower St. Lawrence. Its occurrence on the recently exposed beach of Great Cloche Island suggests that it may be more widely spread about Lake Huron.

Scirpus Clintonii Gray. Michigan: dry sandy plains near Driggs, Schoolcraft Co., no. 3153.

The only stations recorded by Beal are on the Lower Peninsula.

Rynchospora capillacea Torr., forma **leviseta** (E. J. Hill), comb. nov. *R. capillacea*, var. *leviseta* E. J. Hill ex Gray, Am. Nat. x. 370 (1876). *Phacocephalum capillaceum* (Torr.) Farwell, var. *levisetum* (E. J. Hill) Farwell, Report Mich. Acad. Sci. xxi. 361 (1920).

The form with smooth instead of retrorsely barbellate bristles is interesting and worthy a designation, but it has no distinctive range, colonies of it occurring here and there through the broad range of the less localized typical *Rynchospora capillacea*. It is better considered a forma rather than a geographic variety. When it was first published, as noteworthy for its "*perfectly smooth*" bristles, it was clearly stated that "Except in this remarkable particular the plant appears to be undistinguishable from *R. capillacea*." Many subsequent collections strengthen this assertion.

Carex praegracilis W. Boott. (*C. marcida* Boott, 1839, not J. F. Gmel., 1791). Michigan: forming dense carpets in damp sand, Eagle Harbor, Keweenaw Co., no. 3158.

A species of western North America (also South America) primarily of the cordilleran and Great Plains regions, from Yukon to central Mexico, heretofore known as an indigenous plant eastward to Mani-

Photo. E. C. Ogden.

CAREX GARBERI: FIG. 1, small plant, × 1; FIG. 2, orifice of sheath, × 5; FIG. 3, spike, × 5; FIG. 4, staminate scales, × 5; FIG. 5, denuded rachis, × 10; FIG. 6, perigynium, × 10.

C. GARBERI, var. BIFARIA: FIG. 11, portion of plant, × 1; FIG. 12, perigynium, × 10.

C. HASSEI: FIG. 7, spike, × 5; FIG. 8, staminate scales, × 5; FIG. 9, orifice of sheath, × 5.

C. AUREA: FIG. 10, portion of spike, × 5.

Photo. E. C. Ogden.

ZIGADENUS GLAUCUS: FIG. 1, flowering plant, × 2/5; FIG. 2, portion of inflorescence, showing firm bracts, × 2; FIG. 3, capsule, × 2.

Z. ELEGANS: FIG. 4, flowering plant, × 2/5; FIG. 5, portion of inflorescence, showing scarious bracts, × 2; FIG. 6, capsule, × 2.

toba, Minnesota and Iowa (Mackenzie, N. Am. Fl.). The Eagle Harbor colony is certainly indigenous, in damp depressions in the typical barrens of *Pinus Banksiana*.

C. Hookerana Dewey. Ontario: roadside, Schreiber, Thunder Bay District, *Pease & Bean*, no. 23,599.

Another species of the plains and prairies now extended eastward, from Manitoba and North Dakota, to the Lake Superior region. As noted in N. Am. Fl. the specific name was published by Dewey as *Hookerana* (not *Hookeriana* to which it has usually been altered). Dewey's material from Carlton House (type in Gray Herb.) is distinctly called "*C. Hookerana* D."

C. exilis Dewey. Michigan: very abundant (dominant) on a muskeag near Walsh, Schoolcraft Co., no. 3165.

The previously reported Michigan stations are in Keweenaw Co.

Carex **Garberi**, n. sp. *C. aurea*, var. *androgyna* Olney in Bot. King Exp. 371 (1871), not *C. androgyna* Balb. Elencho, 97 (1801). Type: Presque Isle, Erie Co., Pennsylvania, June 9, 1869, *A. P. Garber*,[1] in herb. Olney (Brown Univ.); isotype in Gray Herb. Plate 360, figs. 1–6.

Carex Garberi is the plant treated in Gray, Man. ed. 7: 232 (1908) as *C. bicolor* All., the plant which, after its first collection on Lake Superior, long stood in North America as *C. bicolor*. Agassiz got it in 1848 on the north shore of Lake Superior and it was then identified by Asa Gray as *C. bicolor* and so recorded by Agassiz.[2] Its relationship is, however, with *C. aurea* Nutt. and *C. Hassei* Bailey, with which it has, very naturally, been confused. With *C. Hassei* (figs 7–9) it shares the whitish papillose and dry perigynia and close spike which separate them both from *C. aurea* (fig. 10), which has the spike loosely few-flowered and the mature perigynia fleshy, smooth, globose-pyriform and golden-orange (drying brownish). Mackenzie has been treating *C. Garberi* (*C. aurea*, var. *androgyna*) as identical with *C. Hassei* of the western United States; but, although they are both distinguished from *C. aurea* by their whitish and papillose mature perigynia and closely-flowered spikes, they differ in several important characters, indicated below.

C. Hassei: inner summit of sheath of foliaceous bracts truncate (fig. 9); spikes mostly remote, the terminal usually staminate throughout; scales of fertile spikes (fig. 7) firm, ovate, mostly acuminate or prolonged into long awns, 2–4 (–6) mm. long; lowest scales of terminal spike (fig. 8) firm, 3.5–5 mm. long, acuminate; principal staminate scales narrowed above to blunt tips, not white-margined.

[1] Abraham Pascal Garber, 1838–1881.

[2] Agassiz, Lake Superior, 166 (1850).

C. Garberi: inner summit of sheath V-shaped (fig. 2); spikes closely crowded and imbricated, the terminal androgynous or wholly pistillate; scales of fertile spikes (fig. 3) membranaceous, broadly oblong or ovate to obovate, mostly rounded at summit (rarely acute) or merely short-mucronate, 1.5–2.5 mm. long; lowest scales (fig. 4) of terminal spike membranaceous, obtuse or merely acute, 2–3.5 mm. long; principal staminate scales broadly rounded at summit, with pale scarious margin.

Carex Garberi (fig. 1), abundant on beaches and rocky shores of the Great Lakes from Niagara to the head of Lake Michigan and the north shore of Lake Superior, is stiff, with strict culms 1–3 dm. high, leaves 2.5–5.5 mm. broad; fastigiate and closely approximate spikes 1–3 cm. long; scales almost colorless to medium-brown. The following specimens are in the Gray Herbarium, indicating a general occurrence on shores of the Great Lakes (map 13, dots).

New York: Goat Island, Niagara, June 18, 1865, *Wm. Boott.* Pennsylvania: Presque Isle, Erie Co., June 9, 1869, *A. P. Garber* (type in Olney Herb.—type of *C. aurea*, var. *androgyna;* isotypes in Gray Herb.); damp sand dunes, Presque Isle, *Pease*, no. 12,988. Ontario: shore of Hay Bay, Tobermory, Bruce Co., *P. V. Krotkov*, no. 7144; crevices in limestone, shore of Round Island, Fishing Islands, *Stebbins et al.*, no. 60; limy sand of Sauble Beach, Bruce Co., *Fernald*, no. 3180; peaty depressions in limestone pavement, Great Cloche Island, *Fernald & Pease*, no. 3181; north shore of Lake Superior, 1848, *Agassiz.* Michigan: Isle Royale, *Cooper*, no. 215; calcareous gravel, bordering Bay du Noc, north of Garden, *Fernald & Pease*, no. 3184; calcareous sandy or stony beach of Lake Michigan, east of Manistique, *Fernald & Pease*, no. 8183; wet gravelly shore of Lake Michigan, Mackinaw City, *Gleason & Gleason*, no. 60; sandy banks of creeks, Big Stone Bay, Emmet Co., *Ehlers*, nos. 309, 505; shore of Thunder Bay, Alpena Co., July 15, 1895, *C. F. Wheeler;* Highland Park, Detroit, 1895, *Wheeler*; swale in jack pine plains near Lake Michigan, Glen Haven, Leelanau Co., *F. J. Hermann*, no. 2309; sand dunes near Muskegon, June 28, 1900, *C. F. Wheeler.* Wisconsin: Point of North Bay, Door Co., June 29, 1873, *Schuette;* damp sand, Sand Beach near Rowley's Bay, Door Co., *Pease*, no. 18,007; Racine, June 19, 1881, *J. J. Davis.* Indiana: wet sands, Pine, June 7, 1884, *E. J. Hill*, no. 35; sandy open woods, Pine, *Lansing*, no. 2721.

Typical, strict *Carex Garberi* (fig. 1) of the Great Lakes region has a smaller representative (figs. 11 and 12) in the Northeast and in the Northwest. This plant is weak and flexuous, with leaves narrow, spikes fewer-flowered, short (0.5–2 cm. long) and more spreading on arching peduncles and less approximate, castaneous scales, and perigynia (fig. 12) often with longer stipes and more papillose. It occurs along the rivers and shores from Gaspé Co., Quebec to northern New England and, still farther to the west of the Great Lakes, in the

Canadian Rocky Mountains. On account of this geographic segregation of its areas the plant may be called

C. Garberi, var. **bifaria**, var. nov. (tab. 360, figs. 11 et 12), a var. typico simillima a qua differt habitu laxiori, culmis gracillimis flexuosis ad 4.5 dm. alto; foliis 1–2.5 mm. latis; spicis vix confertis plus minusve subdistantibus, 0.5–2 cm. longis; squamis castaneis (rare pallidis); perigyniis plerumque longe stipitatis valde papillosis.—Calcareous gravelly, sandy or ledgy shores, Gaspé Co. to Quebec Co., Quebec and the St. John River, New Brunswick and Maine; southern Alberta and southern British Columbia. Type: wet limestone ledges by River Ste. Anne des Monts, Quebec, August 3–17, 1905, *Collins & Fernald* in Gray Herb. (map 13, *x*'s).

Map 13. Range of Carex Garberi (dots) and of var. bifaria (*x*'s).

Most of the specimens have been distributed either as *Carex bicolor* All. or as *C. Hassei* Bailey; a few of them as *C. aurea* Nutt. In mature fruit there is no difficulty in distinguishing *C. Garberi* and its var. *bifaria* from *C. aurea*. When immature they are difficult to tell with certainty. The foliaceous bracts of *C. aurea* are usually more prolonged, the spikes (fig. 10) less crowded or even remote and more peduncled, the flowers or fruits comparatively few and less densely overlapping, the scales longer and more often acuminate; and when the perigynia have dropped the denuded axis of the spike in *C. aurea* has the scars or joints more remote than in *C. Garberi* (fig. 5).

C. scirpoidea Michx., var. convoluta Kükenthal in Engler, Pflanzenr. iv^{20}. 81 (1909). Originally cited only from Thunder Bay Island, Michigan. The following are in the Gray Herbarium, showing a broad range on calcareous shores of Lake Huron. Ontario: Little Eagle Harbor, *J. Macoun*, no. 33,729; Bruce Co., 1871, *J. Macoum;* limestone pavement and gravel, Great Cloche Island, no. 3188. Michigan: Drummond's Island, *Winchell;* Point Detour, June 30, 1860, *Wm. Boott;* Thunder Bay Island, July 18, 1895, *C. F. Wheeler.*

This plant of shores of Lake Huron is strongly pronounced in its convolute to almost filiform leaves.

C. CONCINNA R. Br. ONTARIO: dry arbor vitae woods on limestone pavement, Great Cloche Island, Manitoulin District, no. 3201; Cove Island (off Tobermory), Bruce Co., *Krotkoff*, no. 7183 (Univ. of Toronto). WISCONSIN: sandy woods on beach, Ephraim, Door Co., *Pease*, no. 18,016.

The only Ontario station given by Macoun or represented in the National Herbarium at Ottawa is on Lake Nipigon. The Wisconsin station is slightly farther south than the Michigan station (Big Stone Bay) cited by Mrs. Ehlers (Papers Mich. Acad. Sci. iv[1]. 209).

C. RICHARDSONI R. Br. ONTARIO: turfy limestone pavement, Cloche Peninsula, no. 3202. MICHIGAN: wind-swept crests, crevices and talus of sandstone-conglomerate, West Bluff, Keweenaw Co., no. 2303.

Already recorded from the Bruce Peninsula and from stations farther east in Ontario; not previously recorded, I think, from the Upper Peninsula of Michigan.

JUNCUS VASEYI Engelm. MICHIGAN: dry sandy plain near Driggs, Schoolcraft Co., no. 3223.

Apparently the first record for the Upper Peninsula.

ZIGADENUS GLAUCUS and Z. ELEGANS (PLATE 361).—In the current manuals the plant of the St. Lawrence basin, from Minnesota eastward to the limestones, shales and slates bordering the Gulf of St. Lawrence, is treated as *Zigadenus chloranthus* Richardson or, by those who do not like genera of many species, as *Anticlea chlorantha* (Richardson) Rydb., while *Z. elegans* Pursh or *A. elegans* (Pursh) Rydb. is, correctly, treated as a more western species. The characters used to separate the two plants as given by Rydberg (Fl. Prair. and Plains) are

Petals and sepals white or straw-colored, greenish only on the midrib, not clawed ..... 1. *A. elegans.*
Petals and sepals greenish, the former more or less contracted into a broad claw ..... 2. *A. chlorantha.*

If these were the only differences the two would surely not be specifically separable, especially since the "white or straw-colored" sepals and petals become in Rydberg's fuller statement "dirty-white"; accordingly, with only these differences commonly stated, in the 2nd edition of the Illustrated Flora Dr. Britton united them. Having known the eastern plant both in the field and in the herbarium since I first collected it in 1902, I have noted several characters in addition

Photo. E. C. Ogden.

RIBES CYNOSBATI: FIG. 2, fruiting branch, × 1.
R. CYNOSBATI, var. ATROX: FIG. 1, fruiting branch, × 1.

to color of perianth which indicate that there is a western species, *Zigadenus elegans* Pursh (1814) and an eastern one, *Z. glaucus* Nuttall, based nomenclaturally on *Melanthium glaucum* Nutt. Gen. i. 232 (1818), the plant erroneously identified with *Z. chloranthus* Richardson (1821). Nuttall's *Melanthium glaucum* was primarily the plant of the St. Lawrence system.

Hab. On the gravelly banks of the St. Lawrence in calcareous soil; around the Cataract of Niagara, on the borders of Lakes Erie, Huron and Michigan and up the Missouri to Fort Mandan. . . . Flowering in July and August.

All the localities cited, except the Missouri River one, are those of the eastern plant; and the flowering period, "July and August," is that of the plant growing from Lakes Superior and Michigan to the Gulf of St. Lawrence. When, in 1834, Nuttall transferred *Melanthium glaucum* to *Zigadenus,* he had in hand the western paler-flowered *Z. elegans,* as clearly demonstrated by the acute leaves, the color of the flowers and the locality:

107 Zigadenus *glaucus;* Melanthium *glaucum,* Nutt. Gen. Am. 1, p. 232. . . . Leaves . . . acute, and a little shorter than the scape which contains about seven flowers; the flowers white, with greenish claws. . . . *Hab.* Towards the sources of the Missouri . . . the flower is decidedly more white than any other color.—Nutt. Journ. Acad. Phil. vii. 56 (1834).

Even though Nuttall at first confused the plant of the St. Lawrence with the prairie species and later described the latter alone, the original *Melanthium glaucum,* the nomenclatural type, was primarily the eastern plant. Since the western element already had a name, *Zigadenus elegans* Pursh, the name *Z. glaucus* should be retained for the eastern element which Nuttall originally primarily intended. This was the decision of Gray, Man. 499 (1848) and in later editions; and *Z. glaucus* may be considered satisfactorily typified. As to *Z. chloranthus* Richardson, Frankl. Narr. 1st Journ. App. 786 (1821), the description is inconclusive, but it came from a region where *Z. elegans* abounds. At any rate its specific name is antedated by those of both *Z. elegans* and *Z. glaucus.*

Returning to the distinctions between the two species, I summarize them as follows.

Middle and upper bracts of inflorescence herbaceous, tapering to firm subulate tips; sepals and petals strongly suffused on the back with green, bronze or purple; capsule ovoid-conic, 1–1.4 cm. long, 5–8 mm. in diameter, barely exceeding the finally connivent perianth; leaves coriaceous, mostly blunt or subacute; inflorescence a few-forked elongate-lanceolate

to open-ovoid panicle (rarely a simple raceme).—Calcareous gravel, cliffs, shores and bogs, chiefly of the St. Lawrence drainage, Mingan Islands and Anticosti, Quebec, to Minnesota, south to northern New Brunswick, western New York, northern Ohio, northern Indiana and Illinois. Flowering from mid-July to September. ..... *Z. glaucus.*

Middle and upper bracts of inflorescence with scarious margins and summits; sepals and petals paler, with or without a darkened area at base or middle on the outside; capsule lance-conic, 1.3–2.2 cm. long, 4–6 mm. in diameter, twice as long as perianth; leaves thinner, usually sharply pointed; inflorescence a slender loosely cylindric raceme (rarely a panicle).—Prairies, meadows and calcareous rocks, Alaska to Arizona and New Mexico, eastward to Manitoba, Minnesota, Iowa and Missouri. Flowering from early June into July (in Rocky Mts. to August) ..... *Z. elegans.*

Plate 361 shows characteristic plants of the two species, × 2/5, with details of bracts and fruits, × 2; the habit of *Z. elegans* photographed from a Wyoming specimen (*Payson & Armstrong*, no. 3774), that of *Z. glaucus* from a Michigan plant (*Ehlers*, no. 648).

As to flowering period the following data from the specimens in the Gray Herbarium are pertinent:

ZIGADENUS ELEGANS

Manitoba: *fr.* July 17
Minnesota: *fl.* June 13–21
Iowa: *fl.* and young *fr.* July 6
Missouri: young *fr.* July 27
North Dakota: *fl.* July 3–7
South Dakota: *fl.* June 9–30
Saskatchewan: *fl.* June 28–July 13
Alberta: *fl.* June 19–August 16 (Rocky Mts.)
Montana: *fl.* June 13–August 11; *fr.* June 13–August 29
Idaho: *fl.* July 11–August 1
Wyoming: *fl.* June 29–August 8; *fr.* August 29
British Columbia: *fl.* June 22–August 10
Yukon: *fl.* June 29–July 18
Alaska: *fr.* July 31

ZIGADENUS GLAUCUS

Quebec: 1st *buds* unexpanded July 10–August 16; *fl.* July 16–September 9; *fr.* August 15–September.
New Brunswick: *fl.* July 30
New York: *fl.* August 10–15
Ontario: *fl.* July 16–August 22
Michigan: *fl.* July 21–September 27
Ohio: *fl.* July 7 and 8
Wisconsin: *fl.* July 28
Illinois: *fl.* July 24–August 3
Minnesota: *buds* and 1st *fl.* July

MAIANTHEMUM CANADENSE Desf., var. INTERIUS Fern. ONTARIO: sandy Jack Pine barrens, Nairn, no. 3234; under *Thuja*, woods on limestone pavement and gravel, Great Cloche Island, no. 3235.

When I described var. *interius*, RHODORA, xvi. 211 (1914), we knew it in Ontario only from north of Lake Superior. In his *Notes on the Range of Maianthemum canadense and its Variety interius*, RHODORA, xxviii. 9–11 (1926), Butters cited no other Ontario stations and concluded that the large, pubescent variety "is distinctly a plant of the deciduous forest . . . it barely encroaches on the northeastern

belt of coniferous forest, and when it does enter this region it is in company with the typical trees and herbs of the deciduous woodlands . . . It appears, therefore, that this essentially western variety, *M. canadense*, var. *interius*, occurs sparingly eastward along the south side of the Great Lakes." It is evident, now, that it follows eastward also along the *north* side of Lake Huron and that it is there in rather boreal surroundings. On the sandy plain near Nairn the plants in the open were mostly sterile but in the shade of *Pinus Banksiana* they were freely flowering and up to 3 dm. high; on Great Cloche Island it was associated with *Carex concinna*, *C. capillaris*, *C. scirpoidea* var. *convoluta*, *Habenaria unalascensis* and other decidedly boreal species in glades among *Thuja occidentalis*, and it there also reached a height of 3 dm.

Cypripedium arietinum R. Br. Ontario: glades among *Thuja*, on limestone pavement, Cloche Peninsula, no. 3247.

Many fruiting plants, with abundant capsules of the preceding year.

Habenaria unalascensis (Spreng.) Wats. Ontario: arbor vitae thickets on the limestone pavement, Great Cloche Island, no. 3251.

Heretofore known between the Rocky Mountains and Anticosti only from somewhere in northern Michigan ("Lake Superior, June, 1860," *Wm. Boott* in Gray Herb.) and the Fishing Islands and adjacent mainland of Bruce Co., Ontario.

Polygonum achoreum Blake, Rhodora, xix. 232 (1917). Blake cited only a single station in Quebec (in Gaspé Co.) and none in Ontario for this northern segregate from *P. erectum* L. It is generally dispersed in open clay soil north to Lake St. John, Temiscaming and the region north of Lake Huron. Our collection is Ontario: clay of roadside near Markstay, Sudbury District, no. 3291.

P. Douglasii Greene. Ontario: about calcareous ledges (with the western *Epilobium paniculatum*) in dry woods, south of Little Current, Manitoulin Island, no. 3292. Michigan: wind-swept crests, crevices and talus of sandstone-conglomerate, West Bluff, Keweenaw Co., no. 3293.

Local east of the Black Hills and the Rocky Mts. Already known from a few stations in Ontario and in Michigan from the islands of Lake Superior.

Cerastium nutans Raf. Ontario: about calcareous ledges in dry woods, south of Little Current, Manitoulin Island, no. 3294.

Macoun cites stations on Lakes Ontario and Erie but none from Lake Huron; but it is represented in the herbarium of the University of Toronto from Go-Home Bay.

Ranunculus fascicularis Muhl. Ontario: peaty pocket in limestone pavement and gravel, Great Cloche Island, no. 3302.

The Ontario stations cited by Macoun are all much further south.

Thalictrum confine Fern. Michigan: glades and openings in thicket bordering calcareous beach of Lake Michigan, east of Manistique, no. 3306.

I find no previous record from the state. For contrast of characters with the western *Thalictrum venulosum* Trel. see Fernald, Mem. Amer. Acad. xv. 279 (1925).

Anemone cylindrica Gray. Michigan: open limestone ledges north of Garden, Delta Co., no. 3308.

Apparently not previously recorded from the Upper Peninsula.

Anemone quinquefolia L., var. **interior**, var. nov., caule superne villoso, villis divergentibus.—Northern Ontario (James Bay) to eastern Manitoba, south to southern Ontario, Ohio, Michigan, Illinois and Iowa. Type: forest, ravine along Pidgeon River, north shore of Lake Superior, Minnesota, July 4, 1924, *Butters & Rosendahl*, no. 4612 (in Gray Herb.).

Familiar with the typical eastern *Anemone quinquefolia*, with the stems glabrous or at most very sparsely appressed-pilose near the involucre, which occurs from eastern Quebec and New Brunswick to North Carolina and across New York locally to Ohio, we were puzzled by the young paler green 1-leaved plants and over-ripe 3-leaved individuals past fruiting, which we found in the dry thickets of northern Michigan. It proves, however, that nearly all material of *A. quinquefolia* from the Great Lakes region north to James Bay has the stems of the flowering plants spreading-villous as are the petioles of the leaves of the 1-leaved young plants and often the petioles of the involucral leaves and the peduncles of the flowers. Var. *interior* is, then, a well defined inland variety, somewhat comparable with *Maianthemum canadense*, var. *interius* Fernald.

I am aware that a Michigan plant, presumably belonging with *Anemone quinquefolia*, var. *interior*, was set off on the basis of its 2-leaved (instead of 3-leaved) involucre as *A. quinquefolia*, var. *bifolia* Farwell, Papers Mich. Acad. Sci. Arts, Let. i. 94 (1923). To take up Farwell's name for the plant with normally 3-leaved involucres which occurs through central-eastern Canada and the Great Lakes states would be quite misleading and unjustified. Var. *bifolia* is an aberration, not a true geographic variety. Individuals with 2 or 4, instead of the usual 3 leaves to the involucre are occasionally found in the more eastern plant with glabrous stems. One collection

(purposely made) from Cambridge, Massachusetts, shows 2, 3 or 4 involucral leaves, and several New England collections show aberrant individuals with 2 or 4 leaves, in all cases collected with the normal 3-leaved type. The selected individuals with 4 leaves have not yet been deemed worthy a latin name; neither have the juvenile plants which have only 1 leaf.

Draba arabisans Michx. Michigan: wind-swept sandstone-conglomerate crest of Lookout Mt., Keweenaw Co., no. 3316. Passing into

D. arabisans, var. canadensis (Brunet) Fern. & Knowlt. Michigan: with the above, no. 3317.

The first station on the mainland of Keweenaw Co., already recorded in Rhodora, xxxvi. 356 (1934).

D. lanceolata Royle (*D. cana* Rydb.). Michigan: crevices and talus of limestone cliff, Burnt Bluff, Delta Co., no. 3318.

The only Michigan station known; recorded in Rhodora, xxxvi. 359 (1934).

Descurainia intermedia (Rydb.) Daniels (*Sophia intermedia* Rydb.). Ontario: limestone pavement and gravel, Great Cloche Island, no. 3322. Michigan: crevices and talus of limestone cliff, Burnt Bluff, Delta Co., no. 3323.

Probably the plant listed by Walpole (Pap. Mich. Acad. vi. 326) as *Sophia pinnata* from the Lower Peninsula of Michigan. Recorded by Macbride (as *Sisymbrium brachycarpon*) in Rhodora, xvii. 140 (1915) from southern Ontario only.

Cardamine parviflora L., var. arenicola (Britton) O. E. Schulz; Fernald, Rhodora, xxix. 192 (1927). Ontario: crevices and talus of hornblendic cliffs and ledges, Cloche Peninsula, no. 3328.

North of previously cited Ontario stations, this is the first locality in the Province represented in the Gray Herbarium. Owing to the past confusion of species in the genus it is probable that the old records need careful scrutiny.

Heuchera Richardsonii R. Br., var. Grayana Rosend., Butt. & Lak. Rhodora, xxxv. 117 (1933). Michigan: sand plain south of Iron Mountain, Dickinson Co., no. 3355.

The range given by Rosendahl, Butters & Lakela, "from Kansas to Indiana and northward to central Wisconsin and southeastern Minnesota" does not include the Upper Peninsula of Michigan.

Ribes Cynosbati L., var. **atrox** (tab. 362, fig. 1), var. nov., ramibus fructiferis crassis ramulisque densissime retrorso setosis; baccis setosissimis.—Ontario: about calcareous ledges in dry woods,

south of Little Current, Manitoulin Island, June 29, 1934, *Fernald & Pease*, no. 3358.

It would be difficult to find a more fiercely armed Gooseberry than that of Manitoulin Island. Typical *Ribes Cynosbati* (fig. 2) has the slender fruiting branches smooth or merely with 1–3 nodal prickles, the berries more or less prickly but not so extremely armed as in var. *atrox*. In the material at the Gray Herbarium of *R. Cynosbati* I find none with the stout and stiff branches nor with anything approaching the bristliness of var. *atrox*. In the Canadian National Herbarium there is a mild approach to it in a specimen from Wingham, Ontario, *J. A. Morton*, no. 749.

Amelanchier huronensis Wiegand, Rhodora, xxii. 150 (1920). Ontario: crevices and talus of hornblendic cliffs and ledges, Cloche Peninsula, no. 3364. Michigan: trees 3–4 m. high at border of woods along Lake Superior, Bête Grise, Keweenaw Co., no. 3361.

Not recorded by Wiegand, though to have been expected, from the Lake Huron region of Ontario.

A. intermedia Spach. See Wiegand, l. c. 147 (1920). Michigan: trees 6 m. high at border of woods along Lake Superior, Bête Grise, Keweenaw Co., no. 3362.

When he revived Spach's species Wiegand had seen it in the Alleghenian region from Vermont to western New York, south to North Carolina. Subsequently, Rhodora, xxiii, 103, I extended its range eastward to Nova Scotia and Prince Edward Island. The tree at Bête Grise is very abundant and characteristic.

(*To be continued*)

A New Species and Two New Varieties of Glyceria.—During a study of specimens of *Glyceria* from Asia, the following species and varieties were found to be apparently undescribed.

Glyceria **kashmiriensis**, nov. sp., *G. nemorali* similis sed culmi erecti; laminis angustioribus 2–4 mm. latis; lemmatibus 9-nerviis.

Culmi 40–50 cm. alti laeves; vaginis laevibus, nervis transversis non prominentibus; laminis 10–15 cm. longis, 2–4 mm. latis, supra subtusque laevibus; paniculis 10–15 cm. longis angustis erectis, ramis tenuibus erectis, 5 cm. longis; spiculis 5–8 mm. longis, 2 mm. latis, 4–7-floribus; glumis ovatis, hyalinis, prima 1 mm. longa, 1-nervia, secunda 1.5 mm. longa, 3-nervia; lemmatibus 2–2.8 mm. longis, obtusis vel acutiusculis distincte 9-nerviis, viridibus; carinis paleae puberulentibus.—Kashmir: Liddar Valley above Palgam, 8,000–9,000 ft., September 17, 1893. *J. F. Duthie* 13,092 (type, No. 948,543, in U. S. Nat. Herb.).

Similar to *G. nemoralis* but culms erect; blades narrower, 2–4 mm. wide; lemmas 9-nerved, whereas *G. nemoralis* Uechtritz and Koernicke has decumbent culms, wider blades, and 7-nerved lemmas.

Culms 40–50 cm. high, smooth; sheaths smooth, cross-nerves not prominent; blades 10–15 cm. long, 2–4 mm. wide, smooth on both surfaces; panicles 10–15 cm. long, narrow, erect, the branches slender, erect, 5 cm. long; spikelets 5–8 mm. long, 2 mm. wide, 4–7 flowered; glumes ovate, hyaline, first 1 mm. long, 1-nerved, second 1.5 mm. long, 3-nerved; lemmas 2–2.8 mm. long, obtuse or acutish, distinctly 9-nerved, green; keels of the palet puberulent.

This species is known only from the type locality.

Glyceria tonglensis C. B. Clarke, var. **honshuana**, nov. var., *G. tonglensi* typicae similis sed ramis paniculorum nunquam reflexis; lemmatibus minus scabris, nerviis glabris.—Japan: Honshu, Lake Nikko to Chuzenji, alt. 2,000–4,000 ft., July 24, 1921. *A. S. Hitchcock* 18,341 (type, No. 1,106,457, in U. S. Nat. Herb.).

Similar to *G. tonglensis* but branches of the panicles never reflexed; lemmas more nearly glabrous, the nerves glabrous. *G. tonglensis* has the branches of the panicle reflexed at maturity; the lemmas and their nerves very strongly scabrous.

To this variety may be referred all Japanese specimens of *G. tonglensis* in the National Herbarium. Its range is the greater part of Japan. Typical *G. tonglensis* is found in the Himalaya Mountains of nothern India and southern China.

Glyceria striata (Lam.) Hitchc., var. **mexicana**, *G. striatae* var. *strictae* (Scribn.) Fernald similis sed lemmatibus 2.2–2.8 mm. longis, acutiusculis.—Mexico: El Chico, State of Mexico, August, 1928. *P. Lyonnet* 267 (type, No. 1,034,156, in U. S. Nat. Herb.).

Similar to *G. striata* var. *stricta* but lemmas longer, 2.2–2.8 mm. long and acutish, whereas in var. *stricta* the lemmas are 2–2.2 mm. long and obtusish.—Leon Kelso, Washington, D. C.

Aster patens Ait., forma **rosea** f. nova, ligulis roseis.

Among the numerous patches of *A. patens* seen on the open downs at Montauk were two clumps characterized by rays of a light lavender-pink instead of the usual deep bluish purple color (*Svenson* no. 4727, Oct. 11, 1931, type in herb. Brooklyn Botanic Garden). Fragments of the original plant are growing luxuriantly at the Brooklyn Botanic Garden and continue to show the handsome pink coloration of the rays. Seedling plants, as might be expected, have the typical blue color.—H. K. Svenson, Brooklyn Botanic Garden.

NOTES ON LESPEDEZA

Milton Hopkins

Several weeks ago Mr. C. C. Deam sent to the Gray Herbarium for determination a set of specimens of *Lespedeza* from Indiana, and pointed out the fact that several sheets of *L. virginica* (L.) Britton possessed a spreading type of pubescence instead of the usual strigose type. In examining these sheets I was impressed by the similarity which they bore to *L. Stuevei* Nutt. var. *angustifolia* Britton, but under close scrutiny several differences appeared. Consequently, it became necessary to study all the material of the close relatives of *L. virginica* in the Gray Herbarium in order satisfactorily to place these specimens.

The current treatment of the genus in our Manuals is necessarily brief and concise, and in many instances this brevity makes accurate identification so difficult that it was felt that a short synopsis of each of the species closely related to *L. virginica* would be exceedingly helpful. The following brief descriptions do not contain any wholly new characters, but they include various ones which have been used in some Manuals and omitted in others.

L. Stuevei: stem erect, virgate or more rarely virgate-branched, densely pubescent with wide-spreading hairs; principal cauline leaflets small for the group, elliptic-oblong to oval or more rarely suborbicular, appearing crowded on the stem, densely strigose-tomentose beneath, slightly less so above; petioles subappressed, shorter than the leaves, averaging 1.7 cm. in length; flower-clusters appearing crowded and sessile to subsessile; peduncles of the petaliferous flowers short, 3–10 mm. in length; calyx and pod commonly villous-canescent.

L. virginica: stem erect, virgate or more rarely virgate-branched, sparingly pubescent with short, closely appressed hairs; principal cauline leaflets linear to linear-oblong, appearing crowded on the stem, strigillose to glabrous above, strigose beneath; petioles subappressed, slightly shorter than the leaves, averaging 2 cm. in length; flower-clusters appearing crowded and sessile or subsessile; peduncles of petaliferous flowers short, 3–12 cm. in length; calyx and pod commonly strigose to strigillose.

L. intermedia: stem erect, virgate-branched, more rarely strictly virgate, sparingly pubescent with closely appressed short hairs; principal cauline leaflets larger than in *L. Stuevei* and *L. virginica*, elliptic-oblong to oval or rarely suborbicular, appearing less crowded on the stem than in the preceding two species, glabrous or very rarely strigillose above, strigose beneath; petioles more spreading than in the above two species, nearly equalling but rarely exceeding the length of the leaves; flower-clusters less crowded, but appearing sessile or subsessile; peduncles of the petaliferous flowers mostly longer than in the preceding two species, averaging 11 mm. in length; calyx and pod commonly strigose to strigillose.

It appears that *L. Nuttallii* Darlington, with its very striking, long peduncles, and the villous pubescence of its stem, is rather clearly distinct from the members of this group, and although its close relationship is readily admitted, it may be safely excluded from a discussion of this nature.

Some varieties of *L. intermedia* and *L. Stuevei* have already been recognized, but in view of the fact that these do not exhibit any peculiar geographic segregations and are to be found throughout the range of their species, and in view of the fact that they differ from the typical form of the species in either the type of the pubescence of the stem or in the shape of the leaflets, it seems wiser to reduce them to mere forms than to maintain them as varieties, and to describe the Indiana plant, likewise, as a form. This may be done as follows:

L. VIRGINICA (L.) Britton f. **Deamii**, n. f., caulis pubescens pilis patentibus.—Sandy hillsides and dry fields and barrens, Connecticut west to Illinois and south to Tennessee. CONNECTICUT: New Haven, without number and without date, *ex Herb. A. Gray.* NORTH CAROLINA: dry hillsides, Swain County, altitude 2000 ft., *Beardslee* and *Kofoid*, 1891. KENTUCKY: barrens of Ky., 2–3 ft. high, *C. W. Short*, 1835. TENNESSEE: Hollow Rock Jc., Carroll County, *H. K. Svenson*, August 27, 1922, No. 456. INDIANA: 4 miles north of Washington, Davies County, Sept. 19th, 1934, *C. C. Deam*, No. 55,645 (TYPE in the Gray Herbarium); 6 miles n. w. of Chesterton, Porter County, 14 Sept. 1934, *C. C. Deam*, No. 55,556. ILLINOIS: Bath, black-jack oak association, Aug. 17, 1903, *H. A. Gleason.*

L. INTERMEDIA f. **Hahnii** (Blake), n. comb. *L. intermedia* var. *Hahnii* Blake in RHODORA xxvi. 29 (1924).

Typical *L. intermedia* possesses an appressed pubescence on the stem, whereas this form has a spreading pubescence on its stem.

L. STUEVEI f. **angustifolia** (Britton), n. comb. *L. Stuevei* var. *angustifolia* Britton in Trans. N. Y. Acad. Sci. xii. 63 (1893); Blake in RHODORA xxvi. 29 (1924). *L. Stuevei neglecta* Britton in Mem. Torr. Bot. Club v. 206 (1894). *L. neglecta* Mackenzie and Bush in Trans. Acad. St. Louis xii. 17 (1902).

The only difference between this plant and the typical form of the species is in the shape of the leaflets, those of the former being linear or linear-oblong, while those of the latter are elliptic to oval.

The various differences between the three species and their forms is brought out in the descriptive key below:

a. Leaflets linear to linear-oblong. . . . *b.*
b. Pubescence of stem appressed. . . . . *L. virginica.*
b. Pubescence of stem wide-spreading or ascending. . . . *c.*
c. Upper surface of leaflets glabrous to strigillose with short hairs, lower surface merely appressed-pubescent; peti-

oles of principal cauline leaves averaging 2.2 cm. in length; calyx and pod commonly strigillose to strigose. ..... *L. virginica* f. *Deamii*.

c. Upper surface of leaflets tomentose-strigose with long hairs, lower surface more densely so; petioles of principal cauline leaves averaging 1.7 cm. in length; calyx and pod commonly villous-canescent.... *L. Stuevei* f. *angustifolia*.

a. Leaflets oval to elliptic-oblong, rarely suborbicular.... *d.*

d. Pubescence of stem appressed..... *L. intermedia*.

d. Pubescence of stem wide-spreading or ascending.... *e.*

e. Upper surface of leaflets glabrous or sparingly strigillose, lower surface strigose; petioles of principal cauline leaves nearly equalling the length of the leaves, rarely exceeding them; peduncles of petaliferous flowers averaging 11 mm. in length; calyx and pod commonly strigose to strigillose..... *L. intermedia* f. *Hahnii*.

e. Upper surface of leaflets tomentose-strigose, lower surface more densely so; petioles of principal cauline leaves shorter than the leaves; peduncles of petaliferous flowers short, averaging 6 mm. in length; calyx and pod commonly villous-canescent..... *L. Stuevei*.

Gray Herbarium.

Festuca sciurea in New Jersey.—While range extensions are still of frequent occurrence even in the eastern States where the flora may be considered to be comparatively well known, yet when an unreported species appears in a region which has been as carefully botanized as the Philadelphia area it seems particularly worthy of note. Few areas have received as much attention from the early American botanists, and the detailed exploration of the territory in recent times by members of the Philadelphia Botanical Club and particularly the meticulous and indefatigable work of Mr. Bayard Long in this region have made its flora one of the most intimately known in the country. But that the flora of any area is not likely to be completely known was illustrated by the discovery of a well-established colony of *Festuca sciurea* Nutt., previously unrepresented from New Jersey, near Mantua, Gloucester Co., on May 7, 1933.

In a dry sandy field and in open oak-sassafras barrens ⅗ mile south of Mantua this native southern species was growing plentifully with the closely related *F. octoflora* L. Its resemblence to the latter species was very marked especially since all of the plants were dwarfs, most of them only 6–10 cm. high and the largest not over 20 cm. The very long awns, however, as well as the remarkably short leaves which were chiefly clustered at the bases of the culms so as almost to form rosettes, at once marked it as distinct, and the first glumes being distinctly more than one half the length of the second showed

that it could not be a depauperate form of *F. myuros* L. The identification was subsequently confirmed by Professor Hitchcock who writes that the species was previously known as far north as Maryland and that collections of it from that State are likewise chiefly dwarfs. Specimens from the New Jersey locality (*F. J. Hermann* nos. 4084, 4137, 4139 and 4434) have been deposited in the U. S. National Herbarium, the Gray Herbarium, the Herbarium of the Philadelphia Academy of Natural Sciences and of the Missouri Botanical Garden.—F. J. Hermann, University of Michigan.

Panicum longifolium in New Hampshire.—On the south shore of the Long Bay[1] of Lake Ossipee in Effingham, New Hampshire, on 10 August, 1934, I collected specimens of a *Panicum* which I at the time mistook for *P. agrostoides* Spreng. As pointed out to me later, however, by Mr. C. A. Weatherby, they really belong to *P. longifolium* Torr., and represent an extension of range from Plymouth and Bristol Counties, Massachusetts and southern Rhode Island and Connecticut. In view of the occurrence of certain other coastal plain species on the margins of sandy ponds in Carroll County, New Hampshire, such as *Eleocharis tuberculosa* (Michx.) R. & S. at White Pond, Tamworth (see Rhodora, **26** (1924), 37–38), *Hudsonia ericoides* L. at Lake Ossipee in Freedom and Ossipee, and *Solidago tenuifolia* Pursh, var. *pycnocephala* Fernald, abundant at several ponds in Ossipee and Madison, New Hampshire and in Lovell, Fryeburg, Brownfield, Harrison, and Limington, Maine, the range of *Panicum longifolium* suggests the need of more intensive study of such localities in this region, which has been somewhat neglected by recent collectors.—Arthur Stanley Pease, Cambridge, Massachusetts.

An Improvement in the Method of Preparing Certain Gymnosperms for the Herbarium.—Difficulty usually attends the preparation of exsiccati of the genera *Picea*, *Tsuga* and *Abies*, in that they lose most, if not all, their leaves in the procedure. Boiling fresh specimens has been tried without materially increasing the number of leaves reatined.

For three years the Botanical Laboratory of The University of

[1] Called Leavitt Bay on the U. S. G. S. topographic map.

Tennessee has been using the method here described with more than usual success.

The method is as follows: a fresh specimen, cut to fit the herbarium sheet, is put on a glass plate covered with unthinned herbarium glue or paste. After all portions have been carefully pressed against the glue, it is placed on the herbarium sheet and the larger twigs fastened down with gummed tape. Two layers of medium weight cheese cloth are placed over the specimen. It is then inserted between several blotters and pressed under approximately 100 lbs. weight. After 2 or 3 weeks, during which time the blotters may be changed, the cheese cloth may be carefully removed, and the sheet is ready for the herbarium.

Although some leaves are lost in preparation by this method, the number retained averages 60 per cent or more, a much larger percentage than was retained in any procedure previously employed.—A. J. Sharp, The University of Tennessee.

Dwarf Mistletoe on White Pine.—I am unable to find any reference to the occurrence of the dwarf mistletoe (*Arceuthobium pusillum* Peck) upon white pine (*Pinus Strobus* L.) and for that reason it seems desirable to record the collection of it upon what appears to be a new coniferous host-species. The collection was made at Hotel Champlain, Clinton county, New York, by Mr. G. V. Schwartz of the Forestry Department of the Delaware & Hudson Railroad, in November, 1934, and the material, preserved in formalin, communicated to the New York State Museum by Mr. E. W. Littlefield of the New York State Conservation Commission. Data accompanying the collection indicates that it occurred associated with infestation on white spruce (*Picea canadensis* (Mill.) BSP.)—H. D. House, New York State Museum, Albany.

Volume 37, no. 438, including pages 197–228 and plates 352–355, was issued 1 June, 1935.

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